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ELECTRICAL WORLD

NOVEMBER 21, 1931
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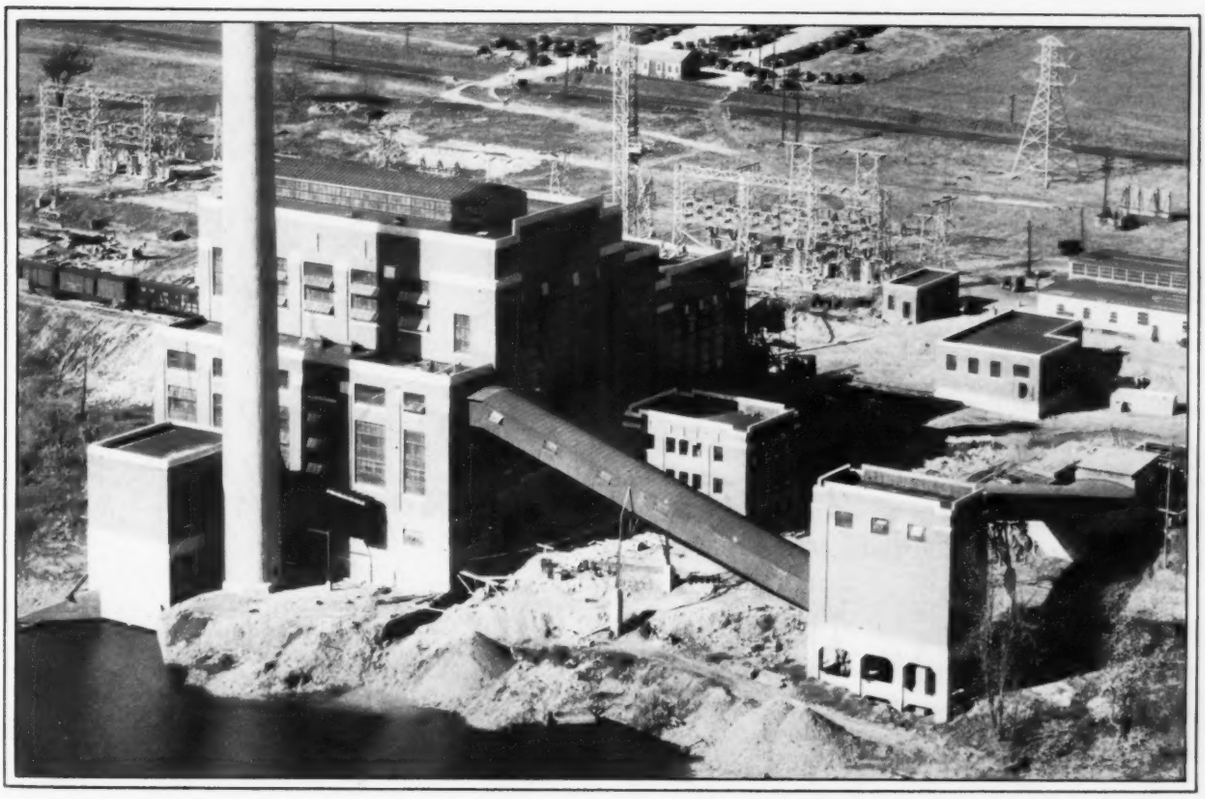

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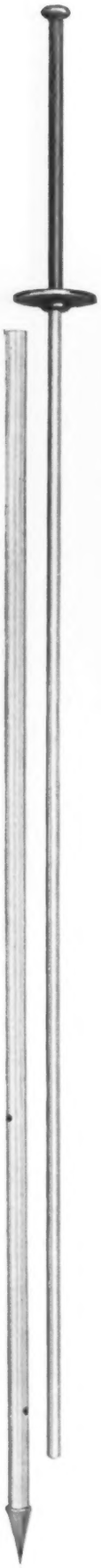

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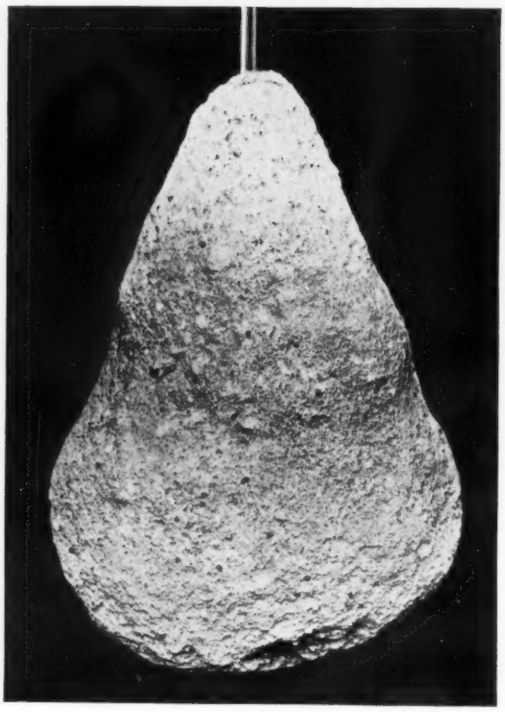

Extent and effect of treating is clearly shown in these photographs.

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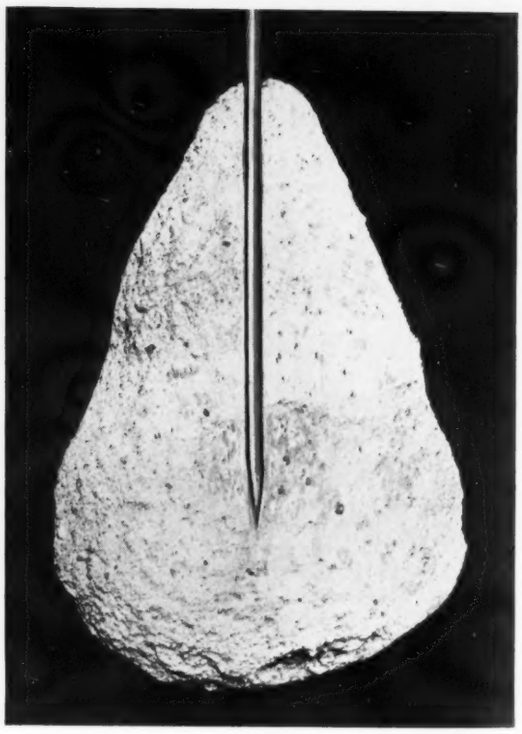

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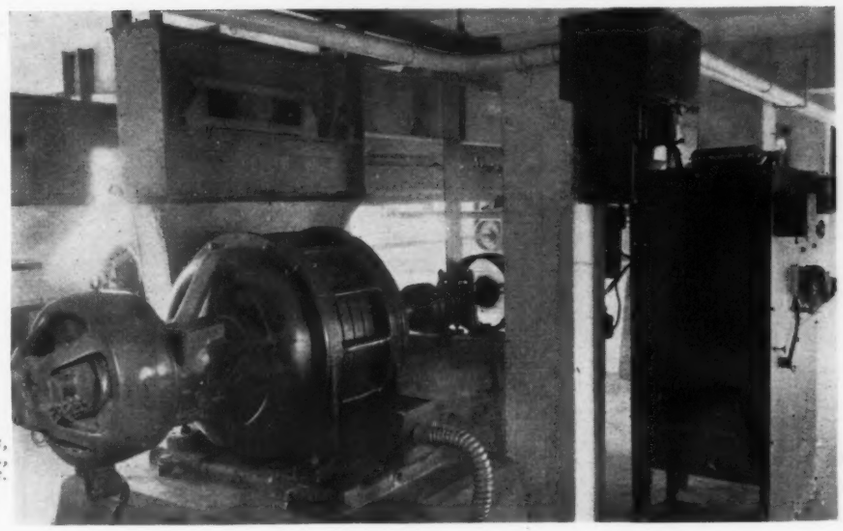

75-hp. linter drive, Lockney Cotton Oil Co., Lockney, Tex.

NOVEMBER 21, 1931

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ELECTRICAL WORLD

Established 1883. McGraw-Hill Publishing Company, Inc.

for the Week Ending

November 21, 1931

We may expect, roughly, 123,000,000,000 kw.-hr. per year as the maximum possible output from water power in the United States at a cost three to four times larger than the equivalent output of steam power.

GEO. A. ORROK,
Combustion Engineer

St. Lawrence overtures become formal

—**New St. Lawrence discussion** starts with formal overtures by accredited representatives of Canada and the United States. Will Canada ask a $400,000,000 credit for that country because of work already done?—*p. 895.*

—**N.E.L.A. committee reports** on water-heating progress and prospects based upon a three-year study of national factors. Controlled service indorsed as offering advantages to both user and utility company— *p. 910.*

Electrical World has a new home

—**330 West 42d St., New York,** becomes headquarters of Mc-Graw-Hill Publishing Company. Coordination of publishing activities in new McGraw-Hill Building will mean better service to business paper readers—*p. 915.*

—**Outwitting the current thief** became an important necessity on one property where 1,500 out of 9,000 customers in one town were cheating the utility. Outdoor meters and improved sealing proved a cure—*p. 924.*

Average industrial rate 1.31 cents

—**U. S. Census of Manufactures** for 1929, just released, shows purchased-energy use and price paid for first time. Cost of purchased power but six-tenths of 1 per cent value of manufactured products—*p. 923.*

—**Economics in engineering** is plea of President Monroe of Sargent & Lundy. More rapid writing-off of plants and equipment urged to meet new era. Electric utilities viewed as in favorable position—*p. 904.*

Research group discusses insulation

—**Bituminous Coal Conference** held in Pittsburgh for third international discussion of uses and of possibilities of improving technical utilization of coal as a raw product. Orrok shows fuel-generation of energy to have advantages over hydro—*p. 895.*

—**Utilities berated and upheld** at meeting of American Academy of Political and Social Science. Field and function of holding companies, rates, regulation, valuation, ownership factors and industry future debated by friend and and foe—*p. 918.*

Harvard Meeting Shows How Insulation Research Stimulates Progress

FUNDAMENTAL studies in the physics and chemistry of insulating materials are guiding engineering practice into channels leading to improved reliability of service. Some two dozen papers attested this on Friday and Saturday of last week at the fourth annual conference of the committee on electrical insulation of the engineering and industrial research division of the National Research Council, which met at Harvard University under the chairmanship of Dr. J. B. Whitehead of Johns Hopkins University with a total attendance of about 150.

The chairman announced that the first of a series of monographs on dielectrics has been published under the committee's auspices by Prof. L. B. Loeb on "The Nature of a Gas," to be followed by others on electric discharge and conduction in gases, solid and liquid dielectrics, electrical properties of glass and other related subjects. Current research, Dr. Whitehead said, includes intensive studies of insulating liquids, the properties of colloids, polar-molecular orientation, influence of frequency on losses, and conductivity and electric breakdown in crystals. Measurements with the aid of the amplifier and the oscillograph in combination are throwing a penetrating light upon many hitherto obscure phenomena.

The study of macro-molecules by X-ray diffraction was featured in a paper by Prof. J. W. Williams of the University of Wisconsin, who pointed out that electrical conduction by fibrous substances is primarily due to the presence of internal moisture and ionizable materials. The author suggested that a portion of the loss of energy in these dielectrics in an alternating-current field is due to the existence of polar linkages about which damped oscillations of atoms and groups of atoms may be excited, such displacements constituting a polarization. Molecular models promise useful explanation of physical behavior.

Two-Hundred-Fold Improvement

In a study of the influence of ash constituents upon the electrical conduction of cotton, A. C. Walker and M. H. Quell of the Bell Telephone Laboratories showed that a total improvement of 150-fold to 200-fold in insulation resistance is possible through proper washing and drying. Profs. F. G. Keyes and J. C. Slater of the Massachusetts Institute of Technology presented papers respectively on "Dielectric Constant and Molecular Interaction" and "Molecular Structure and Valence."

In a paper on "Some Dielectric Properties of Vulcanized Rubber," Donald W. Kitchin, Simplex Wire & Cable Company, pointed out that there must be some modification to the theory that anomalous dispersion and absorption are due to the idea that rubber-sulphur compounds are dipolar, as the addition of sulphur to all the double bonds of the rubber molecule does not give a balanced molecule.

A precision bridge for the measurement of power factor in small oil samples was described by Profs. J. C. Balsbaugh and P. H. Moon of the Massachusetts Institute of Technology. A. Banos, Jr., of Johns Hopkins University, gave a paper which concluded that the predetermination of the alternating-current behavior of dielectric liquids and solids can be achieved from a study of their short-time direct-current characteristics.

Dr. H. H. Race, General Electric Company, discussed the effects of oxidation on commercial insulating oils, and Dr. L. A. Welo, Commercial Cable Corporation, spoke on conductivities of low order in hydrocarbons and transformer oil. F. E. Haworth and R. M. Bozorth, Bell Telephone Laboratories, abstracted a paper on "Electrical Noise Accompanying Conduction in Insulators," and E. J. Murphy of the same organization spoke on conduction and residual polarization in powders. J. B. Miles, Jr., of the Dupont company read a paper on the dielectric behavior of films and solutions of cellulose derivatives at radio frequencies. Fundamental concepts of dielectric behavior were discussed by Dr. W. F. G. Swann, Bartol Research Foundation, and dielectric analogies of ferromagnetism were considered by Prof. Hans Muller, Massachusetts Institute of Technology.

That existing formulas for paper-insulated cable characteristics in relation to time and voltage have limitations deserving serious investigation was the theme of a paper by R. W. Atkinson, General Cable Corporation. Tests with a surge generator on cables which failed within five to ten microseconds indicated that the usual exponential relations did not have any application in the microsecond range.

Research on Cable Papers

Prof. C. L. Dawes reported on research under way at the Harvard Engineering School on cable papers impregnated with various types of compounds and also on results of studies of the electrical characteristics of ionized gas films. For impregnated paper it was shown that for any constant temperature the power loss increases as a constant power of the voltage, the exponent being about two. It was further shown that for any constant frequency the power loss can be resolved into two components, each of which is an exponential function of the temperature. The exponent of the first component is about one, and this component represents the entire loss up to about 50 deg. C.

R. J. Wiseman, chief engineer Okonite Company, described accelerated life tests on cable under overvoltage. Results show need of improving test methods as cables with rapid increase in power factor have taken as long to fail as those showing fairly constant power factor. A test method permitting watching of short lengths for power-factor change and for slight temperature increases is desirable. The effect of atmospheric temperatures should also be studied as these produce sheath expansion in some cases.

K. S. Wyatt, Detroit Edison Company, presented a paper on the deterioration of insulating oils under alternating-current corona discharge, in which he maintained that corona discharge may produce marked increases in the dielectric loss of certain oils even when free from all impurities and with oxygen excluded. This also holds for commercial compounds of the non-rosin

Major-General Squier to Walter S. Gifford

Human interest inside and outside the electrical communication industry attaches to this telegram sent last Sunday, of which the ELECTRICAL WORLD received a copy:

NEW YORK, November 15, 1931.

To WALTER S. GIFFORD, President A. T. & T. Co., 195 Broadway, New York.

As a doctor of philosophy in physics, mathematics and chemistry of the Johns Hopkins University in 1893, I appreciate the continuous procession of pamphlets which have emanated from your research staff during the past few years. In the face of these valuable contributions to pure science, which only a monopoly could finance in these times, we still require two wires instead of one wire to transmit the word "hello" from New York to Chicago. The whole radio art has taught us the utility and economy of the open circuit for communication around the world. If you will found an American Nobel prize of $50,000, this problem will be solved inside of a year.

GEORGE O. SQUIER,
Major General.

type. D. W. Roper, Commonwealth Edison Company, Chicago, described tests upon 66-kv. and 33-kv. cable from which he deduced that uniformity of impregnation is a vital factor in service continuity. Other speakers were Professor Whitehead, J. A. Scott of the General Electric Company, J. C. Balsbaugh and P. H. Moon.

▼

Negotiations with Canada on River Formally Begin

FORMAL, AS DISTINCT from informal, negotiations between the United States and Canada over the St. Lawrence River navigation and power scheme were, by federal admission, begun on November 14 at Washington when W. D. Herridge, Canadian Minister, and Secretary of State Stimson conferred. An official statement by the State Department indicated that considerable progress was made toward agreement on the preliminaries. "A treaty by Christmas" is in some quarters alleged to be the federal administration's aim.

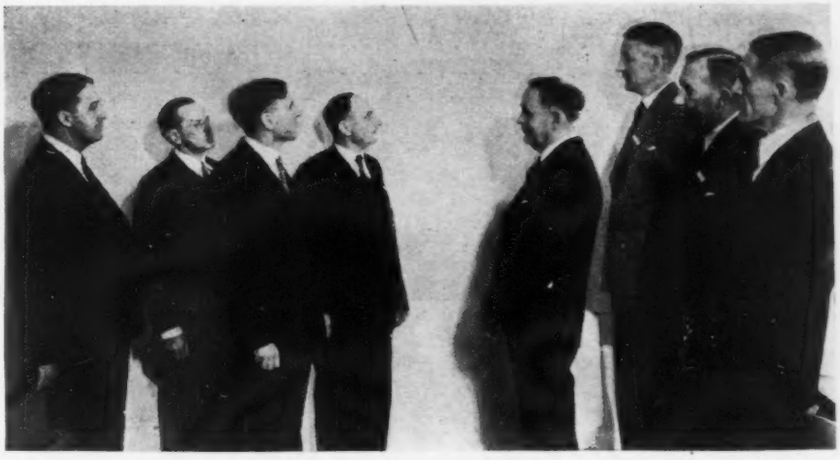
As a result of the conference the Joint International Board of Engineers is to be reconvened with the view of harmonizing differences which appeared during its previous deliberations over plans for developing the international section, particularly as regards whether a one-stage power development, as favored by the Americans, or a two-stage development, preferred by Canada, shall be adopted.

There was agreement also that the two governments should "keep in touch" respectively with the authorities of the State of New York and the Provinces of Quebec and Ontario concerning state and provincial power rights.

Hanford MacNider, United States Minister to Canada, was present at the conference, as were James G. Rogers, Assistant Secretary of State; John D. Hickerson, in charge of the Canadian section of the State Department, and Hume Wrong, counselor of the Canadian Legation in Washington.

In conflict with the "hundreds of millions" which, as reported last week, Premier Taschereau of Quebec visions Canada as spending to develop power for the United States, attention has been directed to the fact that a Canadian advisory committee appointed by former Premier Mackenzie King set up a claim for Canada to a credit for $400,830,000 already expended on navigation and power in connection with the river and the Great Lakes—including $115,600,000 for the new Welland Canal—against $43,936,000 for expenditures by the United States on the St. Clair and Detroit Rivers and the Sault Ste. Marie Canal.

PURDUE DEDICATES DUNCAN MEMORIAL LABORATORY



Left to right—R. A. Lanphier, president Sangamo Electric Company; Frederick Holmes, president Duncan Electric & Manufacturing Company; R. G. Walter, Wisconsin Power & Light Company; Dean A. A. Potter, Purdue Schools of Engineering; David E. Ross, president board of trustees of Purdue; Dr. F. C. Harding, head of Purdue electrical engineering department; Tom Polk, secretary Great Lakes Division, N.E.L.A., and Dr. E. C. Elliott, president of the university.

Viewing the tablet over the entrance to the Thomas Duncan Memorial Laboratory, added to the Purdue Electrical Engineering Building, Lafayette, Ind., and just dedicated, are seen a group of men well known in electrical and educational circles of the Middle West. *(See last week's issue, page 853.)*

▼ ▼ ▼

Coal and Power Linked at Pittsburgh Conference

GOVERNMENT OWNERSHIP and control of industry, and specifically of the coal industry, was vigorously attacked by Governor Albert C. Ritchie of Maryland, prominent speaker on the first day of the third International Conference on Bituminous Coal, which was in session at Pittsburgh all this week. Governor Ritchie linked coal and power, saying that his plea that business should put its own house in order, organizing and regulating it so as to prevent any recurrence of the existing industrial conditions, applies particularly to industries like the two named.

These industries, he said, are "fields in which the soil of progress has just been scratched. We can look only to private enterprise to develop their potential possibilities. We need but look at its day-by-day developments to see that the technical situation of power is still far removed from such state of perfection as to warrant passing it over to government as a business so completed as to be workable by bureaucrats adorned with arbitrary authority and red tape. The same is true of coal."

Dr. Thomas S. Baker, president of Carnegie Institute of Technology, suggested an eventual co-operation between coal, petroleum, natural gas and water power. Subsequently he was authorized to appoint a committee "for bringing about the economic co-ordination of the coal industry."

Declaring that water power is not free, not cheap and not abundant, George A. Orrok of New York made the assertion that the maximum hydroelectric output to be expected if all the run-off in the United States could be utilized would, if generated by steam at 1.67 lb. per kilowatt-hour, require 73 per cent of the coal used annually in this country.

Many other aspects of the production and use of coal were discussed.

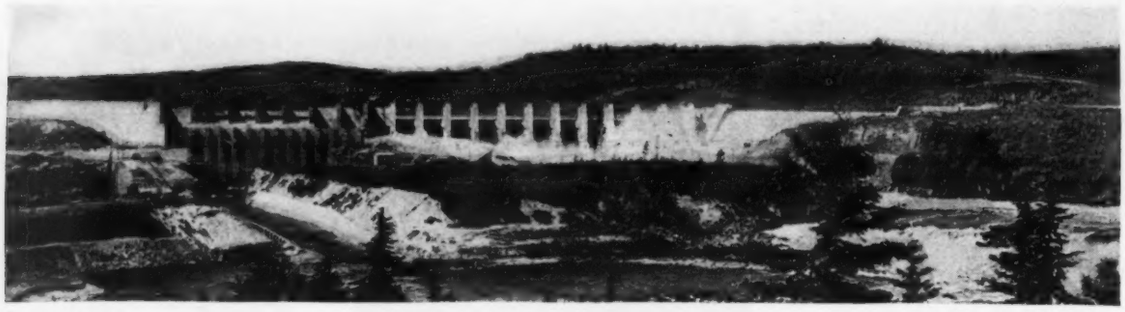
▼

Appliance Merchandising Argued in New York

MERCHANDISING RIGHTS of utilities were argued at Albany, N. Y., on Wednesday before the New York State Public Service Commission at a hearing called on his own initiative by Chairman Maltbie of the Commission. No complainant appeared, but, on invitation to speak, W. J. Foley of the New York State Hardware Association contended that the companies should charge all expenses of their appliance trade to the merchandising departments and not add them to the general operating costs. Several dealers who attended the hearing admitted that the companies had worked with them in selling appliances.

Chairman Maltbie took issue with a statement that utility companies never shut off electricity or gas in cases where payments for appliances were not met, saying that he knew of such cases.

ALCOA POWER COMPANY COMPLETES INITIAL PLANT OF 260,000 HP.



Four 65,000-hp. units are now installed at Chute-à-Caron, on the Saguenay River, Quebec, and the main dam has been completed. Eventually this great undertaking will include the coming 800,000-hp. Shipshaw plant, to operate under a head of 205 ft.

▼ ▼ ▼

Makers Move to Eliminate Substandard Flexible Cord

EIGHTEEN MANUFACTURERS producing about 90 per cent of the flexible extension and heater cord having the approval of the Underwriters' Laboratories have agreed to mark such cord so that the purchasing public can easily distinguish it from substandard cord, according to Charles Abbott, executive director of the N.E.M.A. trade extension group. The identification will consist of a paper-covered metal bracelet bearing the words "Underwriters' Laboratories Inspected Cord," this bracelet encircling the cord at intervals of about five feet.

This safety movement has developed because of the very extensive use of unapproved cords. In purchasing portable lamps and other devices, the public has been at the mercy of the dealers because private purchasers were never able to identify approved cord and because they did not recognize the hazard of substandard cord.

Prior to the World War nearly all types of flexible cord for electrical use complied with standards of the Underwriters' Laboratories, but in 1930 less than 15 per cent of the 2,500,000,000 ft. of flexible cord manufactured bore the label of the Underwriters, and to this cause in large measure electrical fire losses and accidents are attributed. For instance, an item of $579,000 among the fire losses of electrical origin reported for 1930 by the New York City Board of Fire Underwriters, or 76 per cent of total electrical fire losses, was attributed mainly to defective flexible cord. Similar losses are attributed to this cause in other cities.

An extensive advertising campaign will be undertaken by the manufacturers to apprise retailers of appliances and the purchasing public of the new safeguard. National magazines and local newspapers will be utilized in the effort to bring about reform. Light and power companies are becoming interested in the plan, and two utility syndicates have already indicated a decision to call attention to the matter on the backs of their bills to customers.

▼

Middle West Utilities Next Before Trade Commission

UTILITY HEARINGS before the Federal Trade Commission at Washington were adjourned this week until Tuesday, December 1, when the Middle West Utilities Company, the first Insull organization to be investigated, will become the subject of inquiry.

William J. Hagenah, vice-president Byllesby Engineering & Management Corporation, told the commission on November 17 the reasons as the Byllesby interests saw them for the unusual set-up of subsidiaries at Louisville. The transfer by lease of generating equipment to the Kentucky Coke Company, a non-utility, non-franchise corporation, was for the purpose of avoiding the payment of a franchise tax based on capitalized franchise value. The taxing board had capitalized net earnings at 7 per cent, an amount less than allowed by courts as a fair return. Avoidance of the franchise tax was therefore considered justifiable because it constituted taxation on an element of value on which earnings were not permitted.

Robert E. Healy, chief counsel for the commission, complimented the officers of the Louisville companies on their co-operation in the investigation.

▼

Drought Conditions Bad All Through Southeast

STREAM FLOWS that are lower than those of the very dry years of 1925 and 1926 have forced the power companies of virtually all of the Southeast to put most of their steam reserve plants into use. From central Virginia and West Virginia clear around to and including Alabama and Tennessee the present lack of rain is establishing records never reached before. Not only is the flow of streams below all previous stages in most cases, but the prospects are that they will drop still further. Steam reserves still unused seem likely to be ample to meet any power situation that may arise. If they prove not to be, then existing tie-ins with companies outside of the affected area will doubtless take care of any possible shortage.

An indication of conditions in Alabama is the fact that the total storage in the Martin Dam reservoir, with its 305,000,000-cu.ft. capacity, is down to less than 20,000,000 cu.ft. All of the steam plants of that company are on the line, with around 80 per cent of their capacity in use during part of the 24 hours.

As the Tennessee River has reached a stage as low as in 1925 the hydro plants of the Tennessee Electric Power Company on that and adjacent streams can be run only at a fraction of their capacity. This company, however, has ample steam reserves.

Two years' deficiency in rainfall at Atlanta equal to 75 per cent of an average annual precipitation is about a fair example of the conditions in Georgia. With the exception of one reservoir used to help carry the peaks, the hydro plants of the Georgia Power Company are all the way from dry to 10 or 15 per cent of capacity storage. Linemen of that company report that the ground is entirely dry to depths of 6 ft. or more over most of the state.

The immense reservoir of the Lexington Water Power Company on the Saluda River in South Carolina is very low and falling rapidly. That stream has to date in 1931 carried about 90 per cent of the lowest annual run-off of record, with the prospect that its least previous annual discharge will be lowered by about 15 per cent this year. The Broad River Power Company, affiliated with the Lexington Water Power Company, is operating its steam plants to capacity. Two of its hydro

plants on the Broad River with a combined capacity of 23,000 kw. can deliver less than 5,000 kw.

During October the Duke Power Company was able to maintain its reservoir stages on the Catawba River in North Carolina while using a smaller percentage of its steam-plant capacity than in the dry period of 1930. Since then the headwaters of the Catawba have shrunk rapidly, with the indications that this river will soon reach and drop below its minimum stage of record.

Early this month the Yadkin River fell below its previous minimum stage, with a flow of 800 cu.ft. per second. Since all of the watershed of that stream lies in the two-year dry area, it will very probably go considerably lower. The hydro-electric plants of the Aluminum Company of America and the Carolina Power & Light Company on this river are affected accordingly.

Water resources in the mountains of western North Carolina are specially hard hit. The discharge of the French Broad River at the end of October was 38 per cent below normal, with a flow just above the minimum of record. The Pigeon, on which is the recently completed 100,000-kw. development of the Carolina Power & Light Company, had dropped last week to its previous minimum of 100 sec.-ft., with a much lower stage in prospect. Local reports say that the pond of this dam is 60 ft. below the crest of the dam and falling. While the hydro plants of the Carolina Light & Power Company have all been thus affected, that company has tie-in connections that have so far permitted it to avoid recourse to steam reserves.

▼

Idaho Falls Defeats Suit Based on Anti-Trust Law

BECAUSE OF ITS BEARING ON municipal ownership and management of utilities, a decision handed down by the Supreme Court of Idaho in favor of the city of Idaho Falls in a suit instituted four years ago by the receivers of the East Idaho Gas Company against the municipality for alleged violation of state anti-trust laws — said to be the first case of its kind to be tried either in Idaho or any other state—has attracted attention beyond the borders of the commonwealth named. The Idaho Supreme Court's opinion said that the chief question raised was: "Are municipal corporations amenable to the anti-trust law, and was it the intention of the Legislature to include municipal corporations therein?" The complaint made was that by selling below cost electricity from the municipal plant for heating water and for cooking the city forced the gas company out of business.

The court argued that the anti-trust law had not been amended since its enactment in 1911 and therefore was subject to be construed as a whole. The opinion continues: "A careful examination of the act discloses that it was clearly the intention of the Legislature that the use of the word 'corporation' therein was to be limited to private corporations and not to include municipal corporations, and numerous provisions contained therein negative the contention of appellant that it has application to and includes municipal corporations."

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Dnieper River Electrical Project Progresses

TWO HYDRO TURBO-GENERATORS at the 800,000-hp. power house on the Dneiper River in Russia will be placed in commission in May, 1932, and four more later in the year, if the predictions of Soviet officials are realized. The annual output of this power plant when all nine sets are installed will be approximately 2,500,000,000 kw.-hr., the plant being able to utilize 35,000 sec.-ft. The dam, which is founded on granite throughout, is 2,470 ft. in length and designed in the form of an arc having a radius of 1,950 ft. The upper half of the dam is divided into 47 sections closed by sluicegates of the Stoney type 32 ft. 6 in. high and each weighing over 70 tons. The power-station building on the right back of the Dnieper immediately below the dam, which will be 750 ft. long, 69 ft. wide and 65 ft. high, is designed to house nine 77,500-kva. sets in addition to a 3,500-hp. set for the house services.

This station is to supply a vast distribution network with connections to the Donetz mines, but the greater part of the power will be absorbed by a group of metallurgical and other works now under construction on the left bank of the river about five miles from the station itself and to be known as Combined Dnieper Industries. Included in the equipment to be installed in the metallurgical works are twelve 11,000-kva. single-phase electric furnaces and three 16,000-kva single-phase furnaces, mainly for the production of alloys.

Of the six sets constituting the first section of the station, four have been ordered from America and two from Russia. Pipes of 24 ft. 9 in. diameter conduct the water to the turbines, each of which, assuming a head of 122 ft., has a capacity of 90,000 hp., the three-phase, 77,500-kva., 50-cycle alternators being directly connected to the busbars. Each alternator is directly connected to a set of three single-phase 26,000-kva. transformers.

To make the station independent of water-supply variations, especially during periods of low water, a series of steam power stations, with a total installed capacity of 500,000 kw., are also

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AGAIN THE CAMERA SHOWS GROWTH OF DNIEPER PLANT

—Acme

Here is the latest photo of the 800,000-hp. hydro project which Hugh Cooper is building for the Soviet Republic.

IF BRET HARTE COULD REASCEND NOB HILL BY NIGHT!

—Keystone View Co.

San Francisco's financial district is silhouetted against the needle-like rays of powerful searchlights of naval vessels at anchor in the bay. The Ferry Building, well known to travelers, is a pillar of light at the extreme left.

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being constructed and, upon completion, will be connected to the transmission network which is to be served by the Dnieper station.

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Wisconsin Men Look Into "Taxless" Towns

IMPORTANCE OF THE electrical industry as a stabilizing force in a time of business stress was emphasized by Paul S. Clapp, managing director of the N.E.L.A., in an address before the Electric Section of the Wisconsin Utilities Association, which held its annual convention at Milwaukee on November 12 and 13. Nationally prominent speakers addressed the delegates, who numbered 150.

E. J. Kallevang, Madison, retiring chairman, spoke of Chanute, Kan., the so-called "taxless town." He displayed a photostat copy of a 1930 tax bill paid by a citizen of Chanute, D. M. Kennedy, as evidence to refute the claim that revenue from the municipal plant met all expenses. The tax bill, he said, shows that Kennedy paid $163.39 in taxes on his home, assessed at $6,300.

G. C. Neff, vice-president Wisconsin Power & Light Company, declared that the political power program which some Wisconsin politicians are endeavoring to substitute for the existing state program will mean either increased taxes or increased electric rates.

Political threats of further governmental interference with business and uncertainty as to further governmental usurpation of functions of industrial management are prolonging the depression, declared John F. Baker, Wisconsin attorney of the Chicago & Northwestern Railway Company. The mental attitude of the leaders of business is marked by a lack of confidence, he said —a fear which grows out of uncertainty as to what the governments of this country are going to do.

C. C. Bell, Wausau, chairman of the rural electric service committee, reported that 39,106 farmers now receive electric service from central stations in Wisconsin, a gain of 20 per cent over last year.

W. E. Schubert, Appleton, chief engineer of the Wisconsin-Michigan Power Company, was elected chairman of the section for the coming year, and Frank A. Robbins, electrical engineer of the Superior Water, Light & Power Company, was elected vice-chairman of the section.

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Irrigation District Anti-Utility Pleas Overruled

CALIFORNIA IRRIGATION DISTRICTS' pleas against the Pacific Gas & Electric Company were denied on November 9 by the California Railroad Commission. In a single decision the commission first denied, on constitutional grounds of confiscation, an application of the Modesto Irrigation District that the utility company be compelled to withdraw its electric service from that district and thus cease from competing with the district and, second, denied applications by the Modesto and nine other irrigation districts and by fourteen cities asking that the company be ordered to reduce electric rates in these localities to the lower schedules now in force in the Modesto Irrigation District. The cities petitioning were Oakland, Stockton, Fairfield, Fresno, Livermore, Orland, Oroville, Sunnyvale, Palo Alto, San Francisco, Tracy, South San Francisco, Merced and Antioch.

Discussing the second part of its order, the commission cites statutes, decisions of the Supreme Court, decisions of the Interstate Commerce Commission and its own previous decisions, all holding that a reduction in rates to meet competition at particular points does not constitute unjust and unfair discrimination against other areas that the same utility serves. "To hold otherwise," the decision states, "would be to deny the right of a utility company to maintain its own existence by meeting the rates of its competitor."

Attention is called to the fact that California in 1913 placed on its statute books a law forbidding discrimination in favor of certain localities for the purpose of destroying a competitor, but specifically provided that the act "was not intended to prohibit the meeting in good faith of a competitive rate" by a rival.

Scattered Happenings in the Electrical Sphere

UNITED STATES

Merchandising Fight in Kansas Goes On

Final decision in the suit brought by ten Doherty gas companies to have the Kansas anti-merchandising law declared unconstitutional now awaits action by the State Supreme Court, which, on the companies' appeal from an adverse decision of the Shawnee County District Court, granted a restraining order prohibiting enforcement of the law until it shall have reviewed the case.

Territorial Rights at West Memphis, Ark.

Appeal will be taken by the Arkansas Power & Light Company to the United States Supreme Court from a decision of the Arkansas Supreme Court sustaining the right of the City Council at West Memphis, Ark., to grant an electric light franchise to an attorney who in turn assigned the privilege to the West Memphis Power & Light Company. The Arkansas Power & Light Company contended that because of prior investment in a power line serving West Memphis it was justified in resisting the "intrusion by another on the premises it occupied." The State Supreme Court, however, held that a city council may grant or withhold such franchises at its discretion and that the appellant had no exclusive rights.

No "South System" Rates in Indiana

Little likelihood exists that the Public Service Company of Indiana will succeed in its third attempt to set up uniform electric rates in the 83 cities and towns which constitute its "south system" in the state. A statement attributed to the only one of the five members of the Public Service Commission who has viewed the scheme with any favor says that the suggested revision, while it would reduce rates in some districts, would increase them in others and for this reason cannot be adopted by the regulating body.

New Rates for New York and Environs

Uniformity in rates over almost the whole of New York City has been brought about by the State Public Service Commission's approval this week of new electric rates for the Bronx Gas & Electric Company, serving the eastern part of Bronx Borough, identical with those established in the western part and in Manhattan, Brooklyn and Queens Boroughs. The Westchester Lighting Company, which supplies electricity to the northerly part of the Bronx as well as to New Rochelle and other cities in Westchester County, and for whose customers a 28 per cent reduction has been demanded, is about to submit a schedule of reduced rates to the commission.

Beverly Hills Rejects Dam Power

With a definite commitment from the Southern California Edison Company that power costs to the city of Beverly Hills, Calif., would be reduced 15 per cent by the time Hoover Dam is completed and that 10 per cent of the cut would be effective by January 1, 1934, voters in that city on November 6 rejected a proposal that the city enter into a 50-year contract with the federal government for Hoover Dam power. The vote was 121 against the proposed contract and 44 in favor of it. There are 6,591 registered voters in the community.

Alliance (Ohio) Utility Holdings Sold

Property of the Suburban Power Company of Alliance, Ohio, has been sold to the Central Utilities Company of Ohio by Attorney James R. Garfield of Cleveland, special master appointed by the federal court, for $1,780,000 to satisfy a judgment of $2,749,884. The Suburban owned property in 33 of the state's 48 counties.

Fort Collins, Colo., Has Own Inquiry

An inquiry into the fairness of the rates the Public Service Company of Colorado is charging for electrical service in Fort Collins, Colo., and also into the cost and necessary rates of a municipally owned plant is being conducted at the instance of the city by H. S. Sands, consulting electrical engineer of Denver, who will submit a report by February 1. As mentioned last week, Mr. Sands is also making a rate investigation for Denver.

Senator Norris Modifies Views

Senator Norris of Nebraska, after a study of the proposed sites for flood-control reservoirs in that state, has become convinced that the generation of electricity for sale to the public should be linked with each development project. Some months ago the Senator said that irrigation was the prime object to be sought. He now thinks that while irrigation in Nebraska and flood control in the Missouri and Mississippi Valleys can best be secured by the reservoir plan of impounding excess waters in the Platte and Republican Rivers, the federal government should not be asked to bear the entire burden of cost. He wants the federal government to advance the money for construction, charging part of it to the general welfare of the nation, part to the farmers whose land is irrigated and collecting for itself the proceeds of sales of electrical energy generated at the dams and carried over publicly owned transmission lines to municipalities and private consumers.

CANADA

Hydro Site on the Athabasca

Survey work on the proposed power site on the Athabaska River, near Edson, Alberta, will be undertaken by the Calgary Power Company this fall. The project was first mooted in 1911. Lately the cost of development has been estimated as high as $5,000,000. The plant would be about 150 miles west of Edmonton, the nearest important population center, and probable market for the bulk of the power.

Consolidation in Nova Scotia

Plans for consolidation of utilities in which the Nova Scotia Light & Power Company is interested are under way. Three directly controlled companies are being merged—the Dartmouth Gas, Electric Light, Heating & Power Company, Chester Light & Power Company, and Avon River Power Company—and applications for merger have been made by the Sackville River Electric Company and Edison Light & Power Company.

ABROAD

City Plant for El Paso's Neighbor?

Plans are under consideration at Juarez, Mexico, for the construction of a municipal electric light and power plant. The Department of Industry, Commerce and Labor of the Mexican government has given its indorsement.

South Scotland Grid Contract

A contract valued at $1,685,000 for 230 miles of main transmission lines in south Scotland has been placed by the British Central Electricity Board. This virtually completes the contracts required by the board for the construction of the national grid scheme. Since its inception the board has placed contracts worth $106,045,000. Since the beginning of this year the board's contracts have totaled $14,500,000 at par. At the end of September 1,730 miles of transmission lines had been erected, an increase of 913 since the beginning of the year. It is thought that by the beginning of 1933 the construction period will come to an end.

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Coming Meetings

American Society of Mechanical Engineers—New York, Nov. 30-Dec. 4. C. W. Rice, 29 W. 39th St., New York.

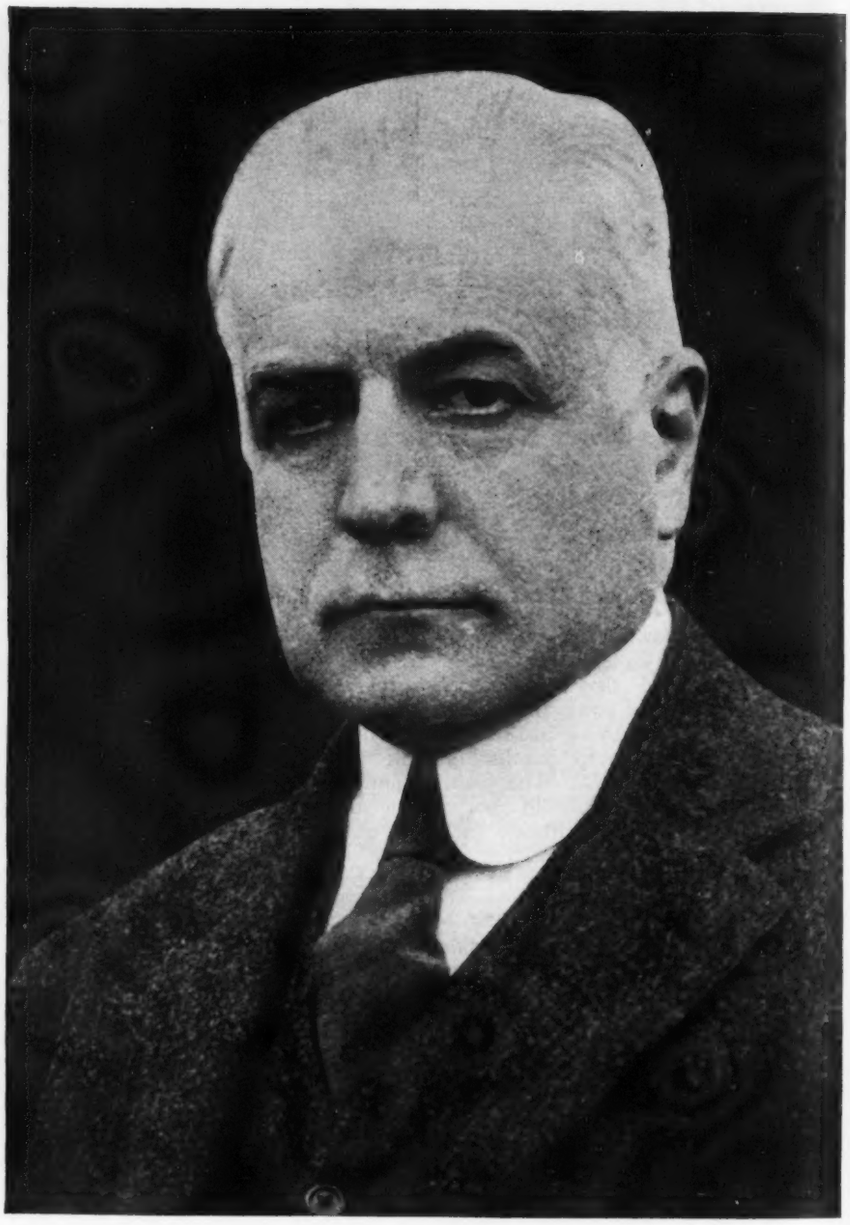
Pacific Coast Electrical Association—Engineering Section, Los Angeles, Dec. 9-11. K. I. Dazey, 447 Sutter St., San Francisco.

American Engineering Council—Washington, Jan. 14-16. L. W. Wallace, 744 Jackson Place, Washington, D. C.

American Institute of Electrical Engineers—Winter convention, New York, Jan. 25-29. F. R. Hutchinson, 33 West 39th St., New York.

North Central Electric Association—Commercial Section, Lowry Hotel, St. Paul, Jan. 29 and 30; Engineering Section, St. Paul Hotel, St. Paul, Feb. 22 and 23. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

National Electric Light Association—Group committee meetings: Engineering National Section, New York, Feb. 1-5; Accounting National Section, Statler Hotel, St. Louis, Feb. 15-17. A. J. Marshall, 420 Lexington Ave., New York.



George Bruce Cortelyou

LARGER political responsibilities have fallen to no utility executive at any period of his career than those borne by George B. Cortelyou from the time when as the discreet secretary of Presidents McKinley and Roosevelt he was called by disappointed news reporters "Mr. Can't-tell-you" to the time when he resigned the Secretaryship of the Treasury in 1909 and accepted the post he has occupied ever since—the presidency of the Consolidated Gas Company of New York, now the controlling company for all the metropolitan electric light and power companies save one or two of comparatively small size.

Before President Roosevelt appointed Mr. Cortelyou to head the Treasury in 1907, as a worthy successor of Hamilton, Gallatin, Chase, McCulloch and Windom, he had been, in reverse order, Postmaster General, chairman of the Republican National Committee (in the presidential election of 1904), organizer and first Secretary of the original Department of Commerce and Labor, secretary to the two Presidents already named, assistant secretary to President McKinley, executive clerk to McKinley and Cleveland, presidential stenographer, chief clerk in the office of the Fourth Assistant Postmaster-General and private secretary to that functionary, confidential stenographer to the Surveyor of the Port of New York and private secretary to the post office inspector in charge at New York.

This retrospective glance at Mr. Cortelyou's career shows a remarkable succession of forward steps on the ladder of fame, with no broken rungs and no false movements. He first entered the government service in 1884 at the age of 22 in the office of the Appraiser of the Port of New York, resigning a year later to become a law and verbatim reporter in association with James E. Munson, author of the Munson system of stenography, being principal of college preparatory schools for four years subsequently, and joining the post office staff, as just related, in 1889. As a youth he had taught music, literature and stenography, having completed a course in the last-named art in four and one-half months.

While in Washington Mr. Cortelyou pursued a course of law at the Georgetown University and was graduated with the degree of LL.B. in 1895. The following year, on completing a post-graduate course in law at the Columbian (now George Washington) University Law School, he received the degree of LL.M. In later years, when he had become a member of the Cabinet, the honorary degree of LL.D. was conferred upon him by Georgetown University, the University of Illinois and Kentucky Wesleyan University.

EDITORIALS

L.W.W.MORROW
Editor

Municipal ownership scores temporary victory

PUBLIC ownership advocates who hope to socialize the light and power industry must be jubilant over a recent "victory" in California. An appellate court of that state has sustained a lower court ruling that the city of Santa Cruz may enter into a contract to purchase a Diesel engine municipal light plant and pay for it out of earnings, without the usual two-thirds vote required for bond issues. The same question has arisen in half a dozen states further east, with varying decisions.

The "pay-out-of-savings" engine people must be happy as well as the friends of public ownership. However, the victory may prove only temporary. Several hurdles remain in the path. In the first place, the Supreme Court of California may reverse the decision. Second, if it is sustained, it may only hasten the day when further restrictive legislation will be thrown around the pursestrings of municipalities. It is hardly conceivable that taxpayers of any city will permit their governing body to launch them into municipal ownership without their having some voice in the matter. Third, and most important of all, it will simply bring the time nearer when there will be a showdown between socialism and the American principle of individualism.

A small and doubtful reduction in electric rates could be the only possible incentive for Santa Cruz or any other city to go into the light and power business. That being the case, why stop there? Why not go into the ice business, sell groceries, distribute milk and what not? The mayor of a Washington town who was running a fuel business on the side recently changed his mind about municipal distribution of light and power when taxpayers suggested that the city go into the coal business and thereby save enough money so that every one would get his lighting for nothing. It all depends on whose ox is gored.

Economics of adequate service

COMMISSIONER LEWIS GOLDBERG of Massachusetts deserves commendation for some plain speaking on the subject of adequate service before the League of Women Voters at a recent conference at Wellesley College on public utilities. The power industry knows that service quality is fundamentally an economic problem, but the public often fails to appreciate how costs control continuity of supply, steadiness of frequency and uniformity of voltage. Low density of utilization in a given area penalizes the provision of service standards justified in denser markets for energy. Therefore "adequate" service is as elastic a term as a "reasonable" standard of living.

While it is unreasonable, as Mr. Goldberg pointed out, to expect a power company to strain its credit to buy apparatus economically unwarranted by the volume of business in sight, there are many cases where additional lines and improved equipment will be found justifiable after engineering and commercial study. System planning, development by centralized management and interconnection are achieving wonders in service improvement. Many a crossroads hamlet today enjoys better service than did its large-town neighbors a decade ago. As the use of energy by customers in outlying territory increases the trend of service quality rises. To provide better service at lower over-all costs is a perpetual

challenge to modern management. Rome was not built in a day, however, and for this reason utterances like Mr. Goldberg's help clarify popular thinking and aid economical, constructive and orderly development.

The industry's responsibility in engineering unemployment

INDUSTRIAL plants, construction organizations, utility holding and operating companies and consulting engineering firms have curtailed their engineering organizations very drastically this year, and this movement has accelerated in recent weeks. Notices, short and summary, have discharged engineers and sent them to join the army of the unemployed. This creates a serious situation that has many and varied aspects and outcomes.

One may inveigh against these actions, as did Dean Potter of Purdue, from the viewpoint that the engineer has invested time and money in the acquisition of education and experience which entitle him in the matter of employment to consideration on a plane of professionalism elevated above the "hiring and firing" of casual labor. Another aspect of the question affects public relations, because the discharged engineers are competent to discuss business and engineering conditions with their friends and neighbors and will certainly not feel in the mood to accord with those who are trying to build public relations with one hand, through actual expenditures for advertising and speakers, while with the other hand, if the expression may be permitted, they discharge their engineers. These engineers also afford potential competition of high caliber with utilities in the taking on of clients in industrial fields where the engineers' knowledge and attitude can unite in making new business difficult.

This attitude is summed up in the words of one discharged engineer: "Well, I'm fired. It cost me money and five years of my life to get a technical education. Then I spent years as a cub engineer at a darn small salary in order to get experience. Even when I went up in the organization my salary was still small because I was told my position was secure and not affected by the mutabilities of business. Now I am out. We built the industry and enabled executives to make rate reductions, give service to every home and place forty horses in the hands of every factory worker. The industry owes its development to engineering skill, but now that a depression has come all this is forgotten and out we go."

There is enough truth in this statement to make it advisable for the industry to do all possible to retain the engineers in its ranks. There is a very deep responsibility and obligation resting upon executives to see that engineers understand why they are discharged if that becomes an imperative necessity. There is also every reason for engineers to realize that conditions in industry have changed, that engineering functions have changed with them and that readjustments are necessary and advisable. All will grant that there should not be large numbers of intelligent and competent engineers out of work in an industry whose growth is due very largely to their skill, industry and allegiance.

Is laminated cable insulation necessary?

SUCCESS has at last crowned the long and patient development work of telephone-cable manufacturing and research engineers who labored to evolve for commercial production a new type of cable insulation in which a solid paper-pulp dielectric would be substituted for the familiar built-up ribbon type. The search has been a difficult one, but such construction has now been made standard for 24-gage and 26-gage telephone cables. According to H. G. Walker, development engineer in charge of pulp insulation of the Western Electric Company: "It is gradually supplanting the ribbon insulating process for fine wire cables, and as soon as practicable its possibilities as to coarser wire cables will be investigated."

Why, indeed, must ribbon-type, built-up insulation be used for power cables? There are interesting possibilities involved in any extension of this telephone-cable principle. Granted the necessity of using some impregnation to increase the dielectric value of the paper, and that nonflexible linking sections of underground conductors and inclosing casings could not be used in duct lines as at present constructed, some form of buried units could be utilized. Such a scheme would offer permanent installations with virtual

improbability of failure due to any but external causes and at an expense which should not be greater than for the present complicated cable structures. A small-diameter pipe filled with oil and provided with frequent concentric high-dielectric solid barriers to support a rigid one-piece conductor section could be readily linked and could certainly be constructed. Patents were issued some years ago, but the matter lags. Underground practices are yet open to developmental ideas, the practical development or institution of which may be achieved only through continued study and research—if at all. But the rewards of increased economy, reliability and permanence are the incentive.

Deeper foundations laid for water heating

IF ANYONE still doubts the value of electric water heating as an opportunity for load building, he will do well to examine the N.E.L.A. committee report on this subject which has recently come from the press and which is summarized elsewhere in this issue. Three years' investigation is embodied in this report. It includes comprehensive tests supported to an unprecedented degree by recording-instrument data, and it deserves scrutiny by executives interested in business development as well as by sales department representatives and the manufacturing and distributing branches of the industry. The tests clearly indicate that at least 3,000 kw.-hr. to 4,000 kw.-hr. per year per installation can be expected where anything like a complete hot-water service is provided, and even at low energy rates of the order of 1.5 cents to 1 cent the resulting revenue is most attractive. This means that on from $3 to $5 per month a great volume of business should be developed, raising the standards of living for many consumers and utilizing existing plant capacity in a very desirable way.

The committee was unable to conduct tests on off-peak or other controlled service in water heating on account of the newness of this development, but between the lines one can read a conviction that controlled services possess economic attractions superior to those associated with unrestricted heating. If the report did no more than to demonstrate the value of water-heating business as a load-building device and as a benefit to the public, it would be well justified indeed. It has laid the foundation for an immediate advance into a most desirable field. The work must be carefully planned and intelligently directed, and for the present it cannot be gainsaid that the power companies, working with the manufacturers, must furnish the necessary commercial leadership. Low energy rates, a suitable sales plan, special organization and effort and adequate supervision are necessary to attain the best development of profitable water-heating service. Equipment prices within the reach of the middle-class pocketbook are also germane.

As for unrestricted versus controlled service, more economic data than are as yet available are needed to clarify the view immediately ahead. The diversity factors of the installations tested by the committee were better than might have been anticipated. The advantages of off-peak service in relation to plant investment, on the other hand, are highly significant. It is to be hoped that further investigation of the subject will result in the production and analysis of many data from controlled service installations.

Steam reserves prove their worth in South

STEAM reserves for hydro-electric plants provided by the power companies of the Southeast after the low flows of 1925 and 1926 are now virtually in full use, owing to another drought in that section. Rainfall deficiencies in the last two years have reduced stream flows in much of the Southeast to new all-time minimums. While conditions are bad, the power companies thus far have had more than enough steam reserves to take care of the demands. But ground water in the affected area is so badly depleted that much more than normal rainfall over considerable periods will be necessary to bring largely increased hydro output. Moreover, there is just a possibility that the lowest stream flows have not yet been reached. Hence the tie-ins with companies outside the affected area may soon prove their worth. Whatever happens, the power companies of the Southeast will have new hydro minimums against which to check their steam reserves.

Future Will Demand More Economics in Engineering

Also economics need more engineering, says Sargent & Lundy president.

Central-station industry has little idle capital in over-built plants.

No fear of necessity for rapid write-off of modern stations.

"MANY causes and excuses are being advanced for the present depression, but one of them probably is that we have been trying to spread over too long a period of years many investments that should have been written off in a very short time," declared William S. Monroe, president of Sargent & Lundy, speaking at the recent convention of the Great Lakes Division, N.E.L.A. Earlier in his talk on "The Economics of Engineering" Mr. Monroe had made the point that as there is need for more economics in engineering, so is there great need for more engineering in economics. Referring to the failure of 2,123 banks involving $1,342,000,000 of deposits, he said that, "The loss or reduction of money values that these failures represent . . . is vastly larger than are the mistakes or failures or incorrect estimates of engineers for many years past. I believe that we of my profession are justified in insinuating that the banking industry might perhaps profit by some good engineering."

Turning from these critical reflections to more definite consideration of his subject, Mr. Monroe said:

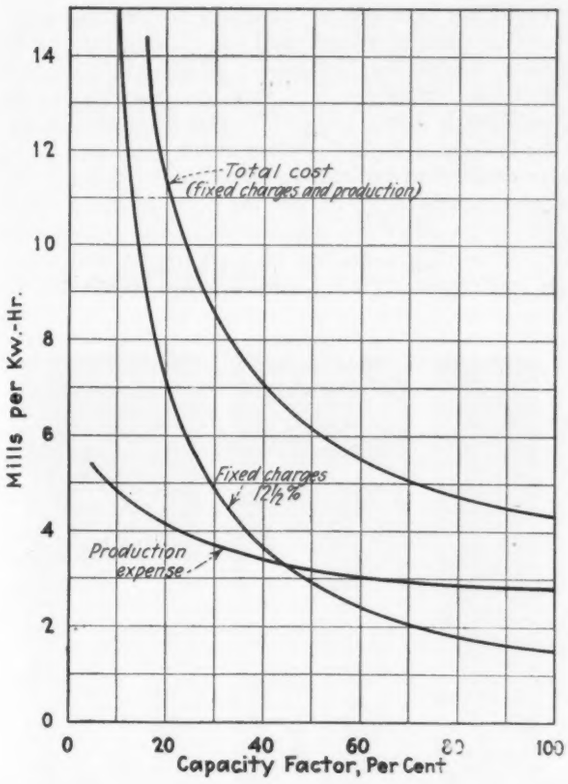
"From a practical point of view, the economics of engineering become largely a matter of recognizing the importance that the fixed charges on the investment bear to the ultimate value of the enterprise. In the industrial activities of the day, as methods of production become more refined—whether it be manufacturing processes or the production and distribution of electric power—the investment in plant and equipment becomes an increasing factor in the cost of the finished product. In our electric power stations, as our technical knowledge and experience have improved, we have considerably reduced the cost of fuel and labor, but it has been difficult greatly to reduce the fixed charges because the cost of the more elaborate and refined technical equipment has nearly offset the reduction in costs that could be effected by the increasing size of units and by reduction in building requirements per unit of capacity."

Overhead costs and amortization

In this connection Mr. Monroe exhibited the two accompanying graphs, the first of which shows the cost of electric power per kilowatt-hour of output in a modern power station for different capacity factors. The lowest curve indicates the production costs, including fuel and labor; the intermediate one, the fixed charges on investment, and the top curve is the total of the other two. He pointed out what a large factor the fixed charges are. At any average capacity factor up to about 45 per cent, the fixed charges are a larger item than the production costs. The production costs per unit of output are fairly uniform but the fixed charges per unit are less than half the total at high capacity factors and mount up very high at the lower capacity factors. At another station, at which the cost of fuel is considerably lower, the fixed charges are a still higher percentage of the total. The curve which shows the relation of fixed charges to capacity factor applies in general form as well to all other investments as much as to power stations. That curve shows that one way to keep down the fixed charges per unit of output is to make the investment work as many hours out of the year as possible. It emphasizes the desirability of increasing the load factor on the system, of getting more off-peak load. As an example, Mr. Monroe instanced that studies of electric heating during the past few years have developed the fact that, given a low rate for off-peak energy, houses and other buildings can be economically heated by electricity, using it only at night, and with perfect regulation and absolute cleanliness.

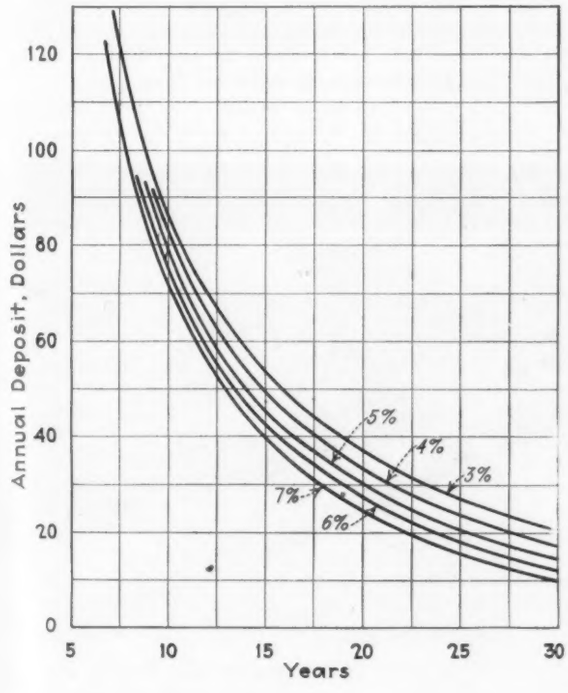
The second graph shows the effect of the life of the plant on fixed charges. It is the ordinary amortization diagram showing the amount of annual deposit that would be required to equal a capital investment of $1,000 in a varying number of years, and at different rates of interest. Of course, the annual deposit becomes rapidly less as the years of life increase, but the graph also shows that if a short life is to be assumed for the investment, interest rates do not make so much difference in the annual amortization as they do if the life is to be a fairly long one.

"These graphs," said Mr. Monroe, "fix attention on the two things which, fundamentally, most affect fixed charges on any investment—the life of the plant or equipment and the use factor or, as referred to power stations, the capacity factor. Admittedly, these two things are both very difficult to predict in advance, especially the life of the plant, but that does not make them



To reduce unit costs capacity factor must be increased

These curves show production expense, fixed charges and total costs per kilowatt-hour in a large utility station.



Effect of life of plant on fixed charges

With interest compounded annually these curves show the annual deposits required to equal $1,000 in various terms of years.

any less important, and it is my belief that they will from now on have to be given very careful consideration by engineers, as well as by financiers.

Amortization a serious problem

"In the electric power industry 'fixed charges' on the investment are usually figured at about 12½ per cent, varying according to conditions surrounding the enterprise from 11½ to about 15 per cent. Generally, interest is taken at 6 per cent, taxes and insurance at 1½ or 2 and the remainder, averaging about 5 per cent per year, is to cover the rather vague, indefinite or uncertain item of depreciation or amortization of the investment which is provided for the purpose of 'writing off' the original investment during the effective life of the enterprise or before it becomes obsolete. Just what should be allowed for this item of obsolescence is a matter of much discussion and impossible of accurate analysis in advance because of the uncertainty of the technical and financial developments of the future. In fact, even after a set of equipment has been put out of service, it is rather difficult to figure just what the amortization allowance should have been.

"Recently, with the aid of E. J. Fowler, chief statistician of the Commonwealth Edison Company, we have been trying to get together some figures to show what the actual amortization has amounted to on some of the older power stations in the Chicago district, assuming they were to have been shut down at the end of 1930. From the figures obtained, I believe that 5 per cent of the original investment set aside each year during the useful life of the plant would have amply covered the amortization.

"Just what should be allowed in the future for amortization I shall not attempt to predict. But because of the present technical development of power stations, I believe that our new high-pressure power stations will probably have a useful life as long as or longer than those which are now considered old type plants. There will certainly be further technical improvements in power stations, but the technical advance will not be as rapid as in the last ten years, and in any analysis of power station costs for the future the matter of fixed charges on the investment will have to be considered of paramount importance. In our methods of transmission and distribution of electric energy, I am inclined to think that developments of the mercury-arc rectifier and the "thyratron" tube are likely to make some revolutionary changes which will compel us to write off some of our present equipment in a comparatively few years.

Utility business not seriously overbuilt

"Many enterprises—in fact, most enterprises—find that their equipment is greatly overbuilt, and they are burdened with fixed charges on considerably more plant than will be needed for their production output for some years to come. The electric power industry, however, is in much better condition than most large manufacturing industries in this regard, because their percentage of excess capacity is not so great as in factories, and because electricity has become such a necessity in the home and in industry that the output of the electric power companies has not fallen off as much in proportion as has the output of most factories. The influence of the large holding companies in the electric power industry has the effect of a much broader planning for the needs of that

industry, which is one reason there is less duplication of plant and equipment than among manufacturing companies throughout the country which are in active competition with one another. Recently a prominent industrial leader has stated that what manufacturing needs in this country is a broader 'national planning.'

"In the years which are to follow this depression technical progress undoubtedly will continue, but probably it will not be quite as fast and furious as it was during the past ten years. It will be more carefully studied and thought out in advance, both from an engineering and an economic point of view. The matter of amortization of plant and equipment will be of increasing importance. Probably new investments in plant, especially in manufacturing industries, will have to be written off in shorter time than has heretofore been considered necessary, due to the fact that the equipment is made obsolete in a few years by scientific and engineering developments and by changes in the product made necessary by the ever-increasing progress in our modes of living."

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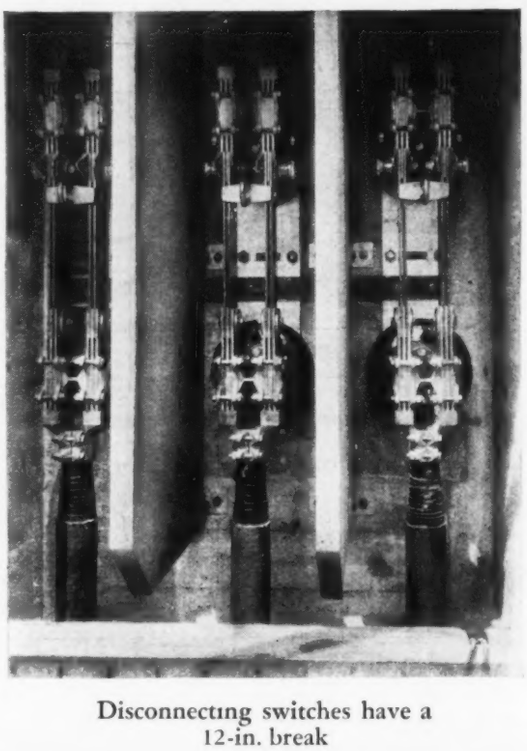
Generator Lead Tunnel Satisfies Many Demands

At the Ariel hydro-electric development of the Inland Power & Light Company the 13,800-volt leads, which tie the 56,250-kva. generator directly to step-up transformers with only disconnecting switches in the circuit, are carried through a concrete tunnel under the transformer platform. The tunnel is 11 ft. wide and 4 ft. 6 in. high and extends from current transformer compartments alongside the generator foundation to a concrete chimney located close to the transformers. The chimney is provided with ventilating louvers and its top is covered by a soapstone slab with roof-entrance bushings. A fan type electric air heater equipped with mercoid type dewpoint control is used to prevent condensation in the tunnel. Entrance to the tunnel is through a manhole located near the chimney.

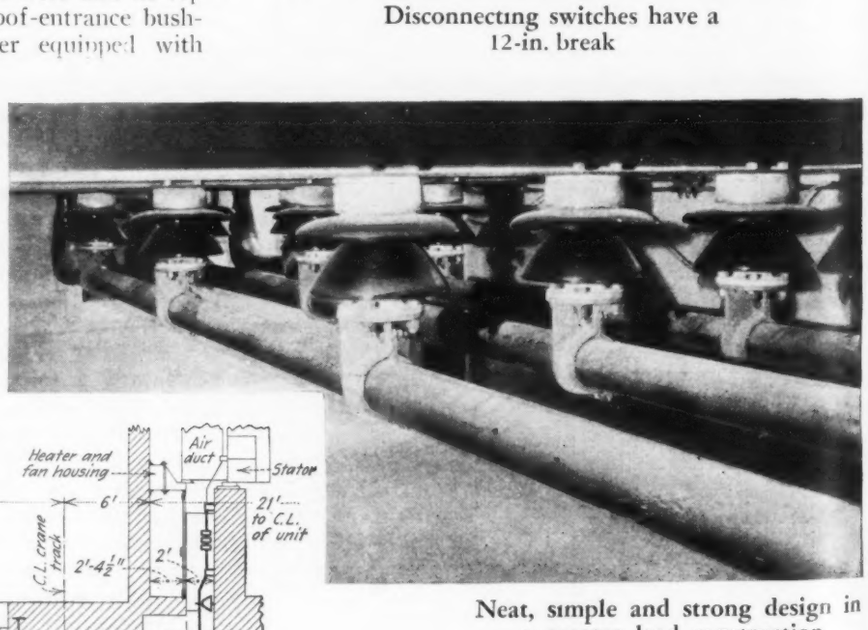
The leads, which consist of 2½-in. double extra-heavy copper tubing insulated with varnished cambric and covered with flameproof and weatherproof braids, are supported on 25-kv. outdoor pedestal insulators mounted on 8-in. H sections. Heavy clamp connectors, designed to provide uniform high contact pressure, are used for making the joints.

The disconnecting switches, which are mounted in the concrete chimney, are of rugged construction and are equipped with blade locks. As the insulators used for the leads have a high flashover value and impulse ratio, it was decided to maintain a consistent design by using a break distance of 12 in. for the disconnecting switches.

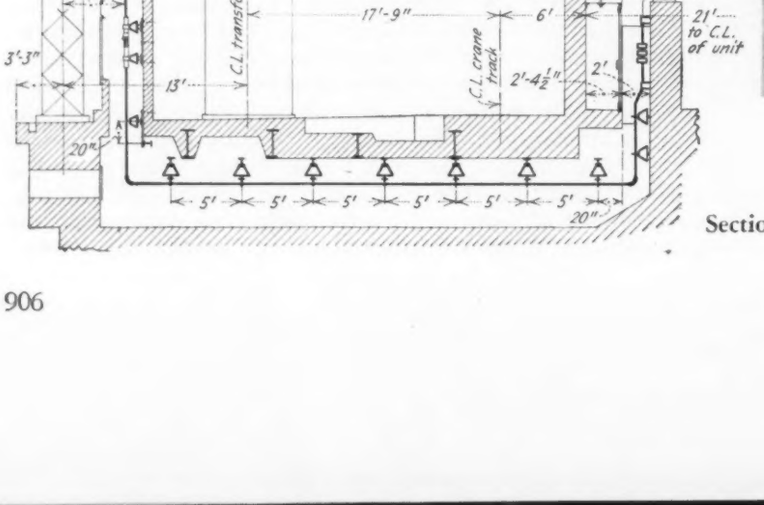
The design described was adopted because it embodied the essential characteristics of high mechanical strength, ample current-carrying capacity, safe electrical clear-



Disconnecting switches have a 12-in. break



Neat, simple and strong design in generator lead construction



Section through tunnel

ances, high factor of safety of insulation, elimination of localized dielectric loss, freedom from trouble caused by moisture or poor ventilation and accessibility for inspection and maintenance.

▼

Present Status of Architectural Contacts

Lighting service bureaus and representatives have been endeavoring to improve the relationships between architects and utility companies for some time in an effort to bring about higher lighting intensities and to insure provisions for adequate wiring in new structures. The results of this work are as yet somewhat undetermined as to the extent of the benefits, but the latter will be cumulatively appreciable as time goes on.

A recent survey of such activities was reported upon by H. H. Balkham, manager of the lighting bureau of the Brooklyn Edison Company, at the preconvention meeting of the Illuminating Engineering Society's Pittsburgh convention.

"A questionnaire was mailed to 365 lighting service engineers located from Maine to California and from British Columbia to Florida," said Mr. Balkham. "While answers to the questions cannot be regarded as conclusive evidence on any one point, they do afford a general cross-section of operation and opinion. Up to the time this paper was completed 156 replies had been received. Those replying represented 144 different lighting companies located in 43 different states. I believe that we are justified, then, in saying that the replies are representative of the nation at large. The 156 individuals replying represent 508 of the 965 lighting service engineers in the nation."

1. Is your lighting service department actively contacting the architectural profession?

One hundred and twenty-nine indicate that they are doing so; 27 make no effort along these lines.

2. Do you have an individual or staff devoting its entire time to this work? If so, how many employees?

Eighty-seven inform us that they have either an individual or staff, the sole duty of which is to contact architects; 69 state that this work is not confined to certain individuals, but is carried on by the lighting service engineer as a routine part of his job. In the 87 companies which have individuals or staffs contacting architects, there are 65 men working full time and 115 men working part time on such work.

3. Is this purely an advisory service or do you endeavor to sell the equipment and/or wiring you recommend?

One hundred and thirteen report that their service is purely advisory, while sixteen endeavor to sell the equipment they recommend; 27 make no contacts of any kind.

4. Do you include wiring diagrams and specifications with your lighting recommendations?

Fifty-one companies submit wiring suggestions in every case; 40 companies include such suggestions when it appears necessary or profitable to do so; 38 never submit wiring plans, and 27 again have no contact with the architect.

5. How many architects are there in your territory? How many have you contacted?

It appears that there are 6,576 architects located in the communities from which replies were received, of which 5,784 have been contacted at some time or other. These figures seem high, and probably are, because several companies may make contact with the same architects. There are less than 8,000 practicing architects maintaining offices.

6. How many regularly accepted your service?

One thousand seven hundred and ninety-three architects have accepted the services of lighting service engineers, a little over 30 per cent of those contacted.

7. Are architects generally soliciting your aid?

One hundred and two of those replying state that architects generally solicit the aid of the lighting service engineer and 54 report no.

8. Have you lectured on lighting to architectural groups? Or have you formed any group contacts, such as local A.I.A. chapters?

Twenty-one report that they have lectured on lighting before architectural groups and 135 have not, for various reasons, been able to make such group contacts.

9. Have you distributed any material on lighting practice to the profession, such as I.E.S. lighting data sheets, etc.?

One hundred and ten have distributed material on lighting practice, such as I.E.S. lighting data sheets, to architects; 46 have not.

10. How is your approach generally received by the architect?

One hundred and four report that the architects in their territory receive them favorably and 52 state that it is still difficult to approach the profession.

11. Have you extended your service to include the consulting engineer?

Sixty-one approach the consulting engineer as well as the architect; 70 do not, and eighteen report that there are no practicing engineers in their various territories.

12. Does the lighting service department form contacts with the architectural profession for the entire company?

Seventy-nine lighting service departments form all architectural contacts for their respective companies and 77 do not.

13. Would official indorsement of your service by the American Institute of Architects be of material aid in furthering your work locally?

One hundred and thirty-four believe that official indorsement of our service by the American Institute of Architects would aid them materially in their work; thirteen believe such indorsement would not be of any benefit and nine doubt that it would make any difference.

14. Do you believe that your company fully recognizes the importance and value of good architectural contacts?

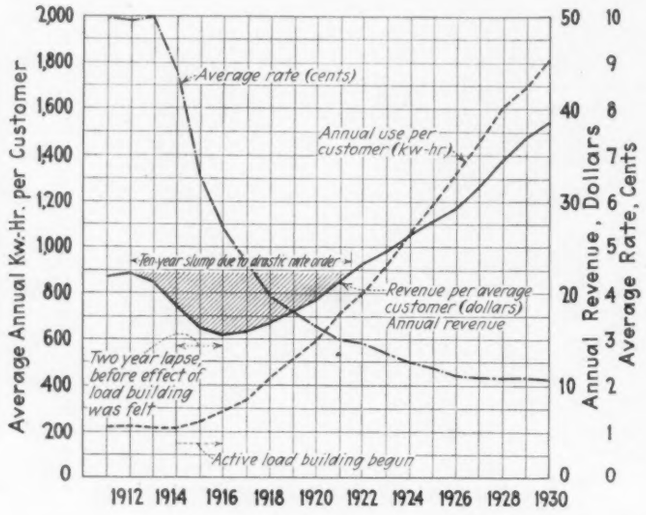
One hundred and twenty-seven state that their companies are fully aware of the benefits to be derived from good contacts with the profession, while 29 say that their companies do not see any advantages.

15. What tangible results, briefly stated, can you ascribe to your work along these lines?

"It is impossible to enumerate the replies to this question," Mr. Balkham points out. "However, the results mentioned by many indicate that, aside from substantial material gains on definite projects, relations with an important group of consumers, the architectural profession, have been materially strengthened."

Rates Go Down, Consumption Goes Up

Results of aggressive load building over a period of years could scarcely be told more effectively than by the accompanying curves. As compared with only ten years ago, customers of the Washington Water Power Company in Spokane are receiving more than three times as much energy now as they did then and at less than two-thirds the 1920 cost. Close to one out of every three domestic customers now cook with electricity. Nearly as many heat water electrically, as well.



Domestic customers in Spokane receive 1,805 kw.-hr. at 2.13 cents per kilowatt-hour

The curves reveal also the effect of rate reductions drastically imposed upon the company in 1913 by order of the municipality. Annual revenue slumped badly until 1916, when it again took an upward trend as a direct result of active load building which was started in 1914. It will be noted that it was two years before the effects of aggressive load building were manifest.

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Life of Paints Tested for Hydraulic Plants

Seventeen samples of paint have been tested under two different submerged conditions and also in the atmosphere, according to a subcommittee of the N.E.L.A. hydraulic power committee. In general, these tests indicated that the paints afforded good protection to steel under water for from three to nine months. However, there were two notable exceptions, in which the paint stood up for 24 months. In the atmosphere the paints were found to be good protection to steel for from six to 36 months, with many samples still good at the end of the test period. From the standpoint of appearance, however, only one sample stood up for the entire 36 months, the others showing a life of from six to eighteen months.

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Individual Drives Operate Cotton Gin Economically

By W. DAN SINCLAIR
Electrical Engineer
Industrial Engineering Company, Memphis, Tenn.

Increased efficiency, from the standpoints of both energy input per bale of cotton and, more important, elimination of costly shutdowns for rush repairs at times when the plant should be running at full capacity, has resulted from the complete installation of individual motor drives in the ten-unit cotton gin built by the Industrial Engineering Company, Memphis, Tenn., for Lee Wilson & Company at Wilson, Ark. The new gin will turn out cotton on the shipping platform at a figure of 13 kw.-hr. per bale. (See opposite page for typical installations in this mill.)

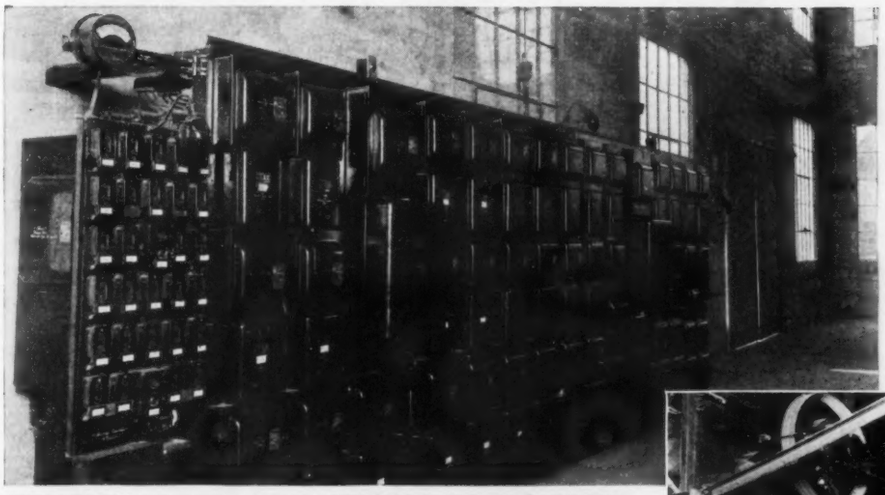
The Wilson company is one of the largest cotton producers in the South and the greater part of its harvest is brought to the new gin. Like all the others, the gin operates at maximum load during the height of the picking season and then, as the field deliveries slacken, slows down. It is necessary, therefore, that the gin have power capacity sufficient for the peak. If the power is concentrated in one unit, or even two or three, and the various machines are operated from line shafts any failure of drive or machine may result in a complete or major part shutdown of the gin right at the time when the load is heaviest. Also, when the load lightens, it is necessary to waste power to operate the gin at a low production level. These disabilities are removed by using individual electric drives on each machine. The separate drive installation costs a little more than group drives, but the difference is more than made up by the saving in power and the greatly increased operating flexibility.

Table of Motor Drives

Number	Machines	Type of Drive	Horsepower	Speed, R.p.M.	Motor Design	Type
2	Suction and air fans	Direct connected	60	1,800	SCHT	MT
1	Suction and air fans	Direct connected	50	1,800	SCHT	MT
2	Cleaner brush wheel	Direct connected	1	1,800	SC	5K
3	Distributor belts	"V"-belt drive	5	900	DWR	5K324
1	Hull fan	Direct connected	7.5	1,800	DWR	5KF284
10	80 saw gin stands	Direct connected	7.5	900	DWRHT	5KF326
3	Seed conveyor	"V"-belt drive	5	900	DWR	5KF324
2	Hancock cleaner	Direct connected	5	1,200	DWR	5K284
3	Tramper	Flat belt	10	600	SC	KT522
2	Hull fans	Direct connected	15	1,800	DWR	5KF326
3	Seed fans	Direct connected	15	1,800	DWR	5KF326
4	Mitchell cleaners	Direct connected	2	500	SC	KT946
2	Hydraulic press	"V"-belt drive	10	900	SC	FT502
5	Quad cleaners	Direct connected	10	600	DWR	KT522
1	Seed cleaner	Flat belt	5	1,200	SC	K284
3	Seed classification	Flat belt	5	1,200	SC	K284
1	Hydraulic press	"V"-belt drive	10	900	DWR	FT502

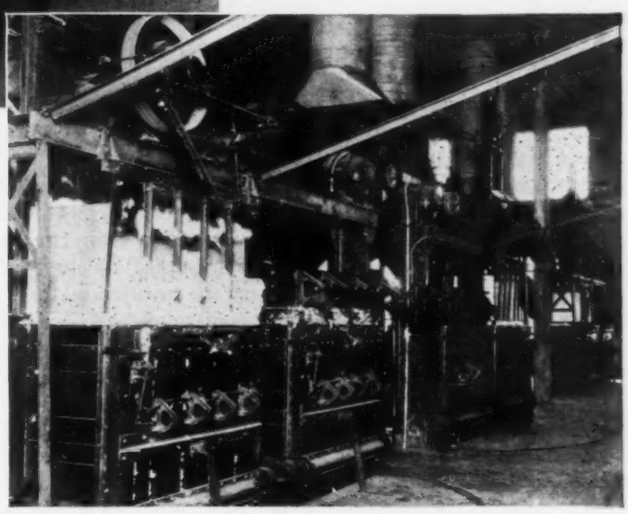
All motors are General Electric, 440 volts, started on line voltage by G. E. magnetic starters and Trumbull disconnect switches, with both local and remote push-button controls. All are rated for continuous duty except the two squirrel-cage motors driving hydraulic presses, which are rated for intermittent.

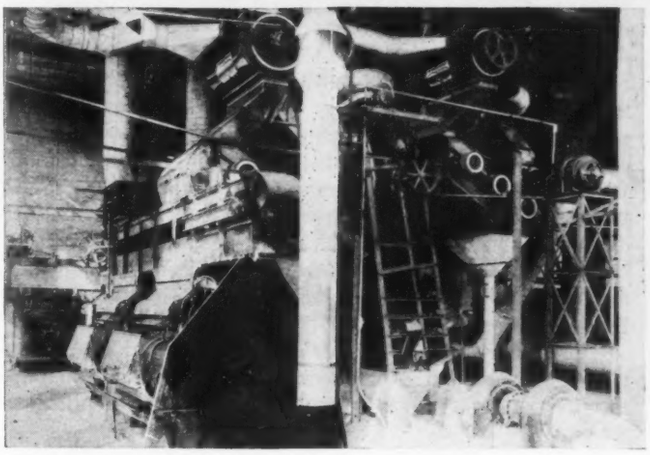
Modern Motorization in a Cotton Mill



Control is concentrated

All motors, 48 of them in sizes ranging from 1 to 60 hp., totaling 507.5 hp., are started directly on the 440-volt line by means of a battery of General Electric magnetic switches mounted on this steel switchboard. Drives are controlled normally by push buttons at the motors, but at each end of the switchboard are push-button panels whose contacts are interlocked with the local controls in such fashion as to permit stopping all motors from the central point or starting them from there if the local controls are properly set.





The two-battery gin

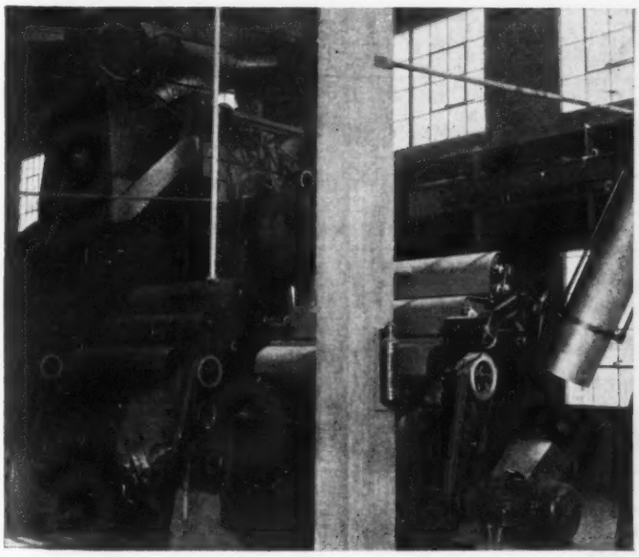
Nine drives are discernible, but only five motors are visible.

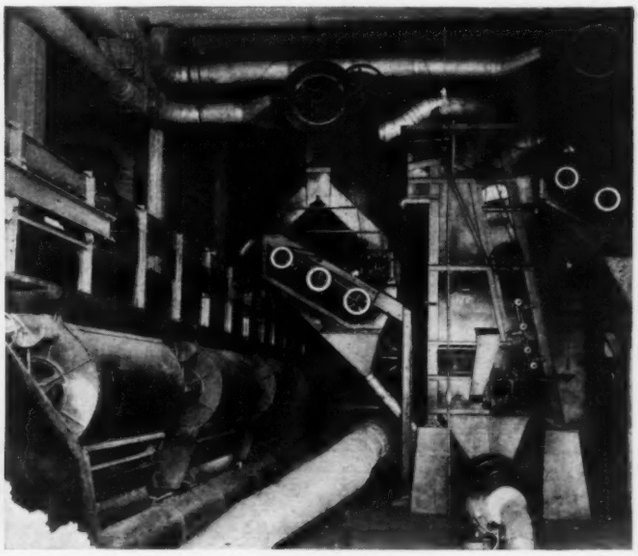
Not called balers

Trampers and presses, they are termed. The lint is tramped down in one of the pair of boxes while the bale is pressed in the other. Then the pair rotate and the second box is filled while the bale is being made in the first.

Fewer belts in the modern gin

The unit drive idea is conveyed in the right-hand picture more by the absence of belts than by the visibility of the motors. Only one motor, and that a small one on top of the hull extractor, appears plainly here, but actually nine unit drives are perceivable in this view of gin. The left-hand picture is an opposite view of the same gin battery. The 7½-hp. gin motors are visible here.





Controlled Water Heating Indorsed

Diversity data support off-peak trend.

Equipment ready for popular acceptance.

Commercial obstacles are no longer formidable.

THAT the power industry faces an extraordinary opportunity to utilize present plant investment in domestic load building is the inescapable conclusion to be drawn from an exhaustive report of the water heating committee of the National Electric Light Association, just issued in report No. 166, under the chairmanship of Norman T. Wilcox. The report represents three years' work to determine why faster progress has not been made in the sale of a service which can be counted upon to add at least 3,000 to 4,000 kw.-hr. per year to the energy consumption of the residential user, and if supplied on an off-peak or controlled basis to add 30 to 50 per cent in revenue per domestic user, with almost negligible increase in system overhead costs.

Except in the Northwest and on the Pacific Coast progress up to 1928 was very slow in achieving popular acceptance of electric water heating. Fundamental knowledge was limited. From the outset the committee agreed that comprehensive field tests must be made in different parts of the country in order to ascertain diversities and consequent investment responsibilities with various kinds of heaters. These tests ended in 1930, more than 30,000,000 calculations being required to check the fifteen-minute readings made to insure dependable data. The first definite data on diversity were published in the N.E.L.A. *Bulletin* last January.

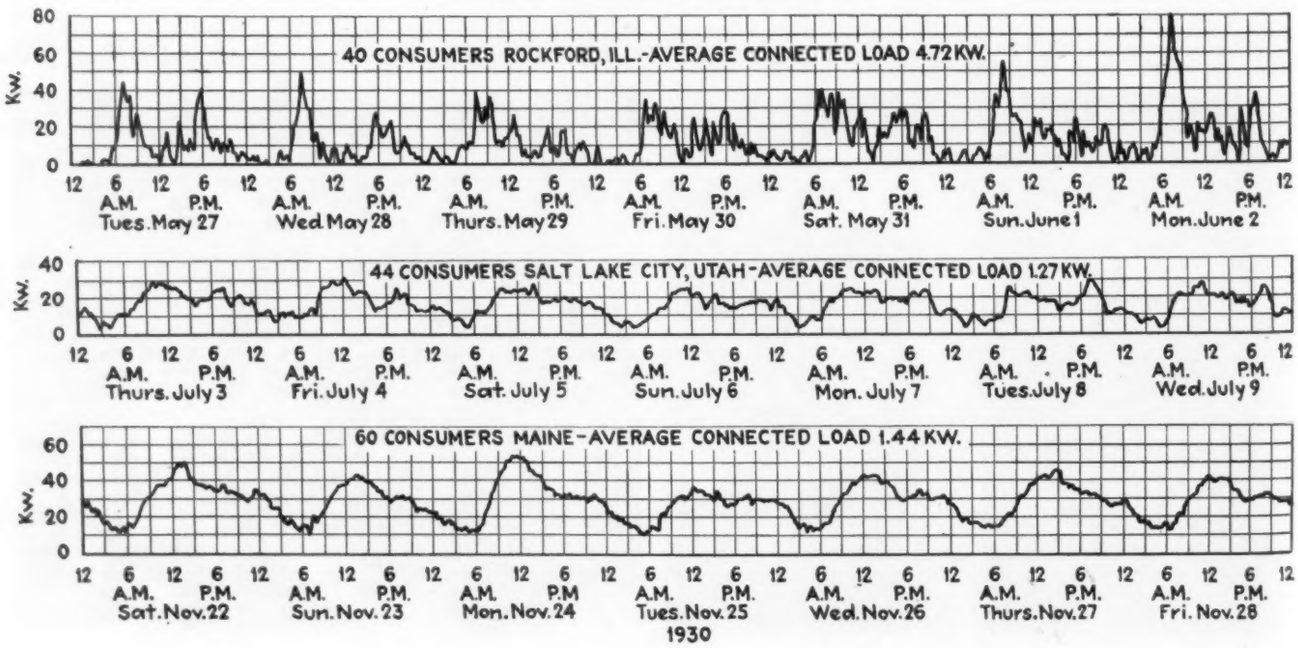
With a better understanding of water heating economics, suitable rates and modern equipment affording real hot water service 24 hours per day where desired, and with practicable installed prices, a large development is possible. It is claimed that in many localities 200 electric water heater installations can be made per 1,000 homes connected. The broad and profitable market lies among those who will pay from $3 to $5 per month for a complete hot water service. The power companies must take full responsibility for development, not a single case having been found by the committee where even with low rates success has been realized through other channels. Favorable terms on which dealer cooperation can go forward are necessary to well-rounded development.

Committee tests were confined to active heaters with unrestricted energy supply, as controlled installations were then too few for complete investigation. Tank capacities varied from 10 to 60 gal. and element ratings from 1 to 6 kw. No tests were made on so-called instantaneous heaters because of the excessive individual demands of this type to deliver a reasonable amount of hot water (1 kw. will produce about 4 gal. of hot water per hour at 100 per cent efficiency with 100 deg. F. temperature rise).

The survey was also restricted to installations having not more than three bathrooms and no mercantile outfits were tested. The committee's experience indicated

Typical week's run of water heater groups

Clamp-on heaters are used in Rockford and internal heaters in Salt Lake and Maine, all on unrestricted service.


40 CONSUMERS ROCKFORD, ILL.-AVERAGE CONNECTED LOAD 4.72 KW.
Kw.
80
60
40
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0
12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12
A.M. P.M. A.M. P.M. A.M. P.M. A.M. P.M. A.M. P.M. A.M. P.M. A.M. P.M.
Tues. May 27 Wed. May 28 Thurs. May 29 Fri. May 30 Sat. May 31 Sun. June 1 Mon. June 2
44 CONSUMERS SALT LAKE CITY, UTAH-AVERAGE CONNECTED LOAD 1.27 KW.
Kw.
40
20
0
12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12
A.M. P.M. A.M. P.M. A.M. P.M. A.M. P.M. A.M. P.M. A.M. P.M. A.M. P.M.
Thurs. July 3 Fri. July 4 Sat. July 5 Sun. July 6 Mon. July 7 Tues. July 8 Wed. July 9
60 CONSUMERS MAINE-AVERAGE CONNECTED LOAD 1.44 KW.
Kw.
60
40
20
0
12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12
A.M. P.M. A.M. P.M. A.M. P.M. A.M. P.M. A.M. P.M. A.M. P.M. A.M. P.M.
Sat. Nov. 22 Sun. Nov. 23 Mon. Nov. 24 Tues. Nov. 25 Wed. Nov. 26 Thurs. Nov. 27 Fri. Nov. 28
1930

that about 60 heaters on test are necessary to obtain complete records on 50. The diversity curve was found to be practically level at the 50-heater point, making it needless to obtain complete records for more than 50 heaters to ascertain the probable diversity within the limits of experimental error for any sized group. A striking variety of occupations and living conditions was embraced in the tests in the various localities.

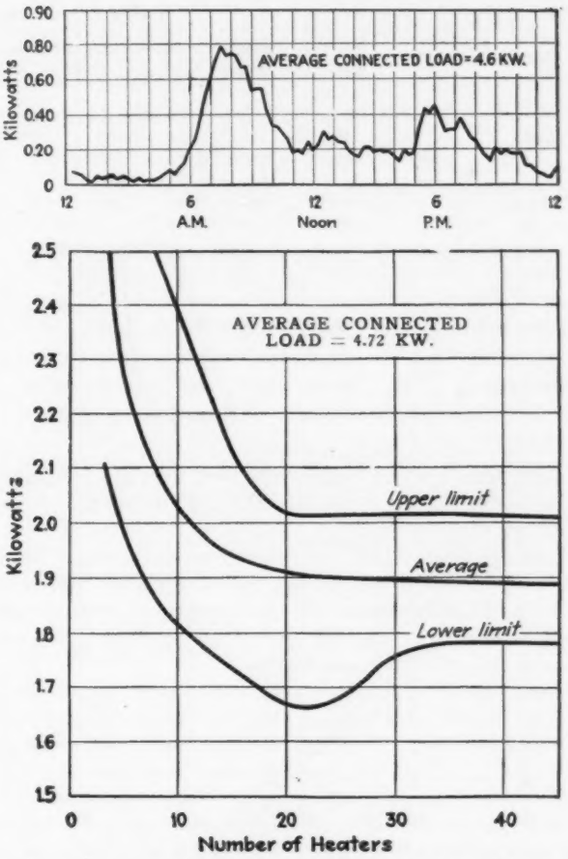
Test range nation-wide

The requirements for test sites were met in Seattle, Wash.; Rockford, Ill.; Salt Lake City, Florida, Alabama and Maine. Methods and procedure were worked out with great care. The report details these at length, showing how the numerous problems encountered were attacked, how diverse conditions were taken into account and material co-ordinated. The analysis of field data, their interpretation and co-ordination of technical results were handled by A. B. Morgan of the N.E.L.A. engineering staff at New York. Supplementary data from Hartford, Conn.; Iowa and Virginia on off-peak heating were also included in the report. Special attention was given to instrumentation, including the use in many cases of recording water meters and thermometers, in addition to graphic meters from which energy consumptions and demands were obtained.

The lowest after-diversity demand occurred with heaters having two 1-kw. units, one of which was operated automatically and the other manually. Forty-four out of 60 heaters used only one element. The average individual maximum demand for the group was 1.27 kw. before diversity and 0.7 kw. after diversity. These heaters did not give a complete hot water service.

With complete hot water service the lowest after-diversity demand occurred with the low-wattage, split-unit 1.5-kw. heaters and was about 0.9 kw. The average monthly consumption of these heaters was 354 kw.-hr. without deduction for heating by furnace coil during the winter, a scheme which tends to increase the fuel consumption of the home about 20 per cent.

In general, with increased ratings the after-diversity demand increased and the energy consumption decreased. Contrary to general impressions, the use of energy did not vary greatly in different localities for heaters delivering different service. The seasonal variation in load depended on furnace coils. The use of hot water was somewhat less in cold weather, but the temperature of the incoming water was lower, thereby making the energy consumption nearly constant. The type of heater was found to have more effect on the energy consumption than did the rate, but a higher rate appeared to limit the number of heaters sold. The measured water consumption was in general somewhat less than the amounts ordinarily used in estimates.



Average and after-diversity demand of Rockford clamp-on heaters

Table I summarizes the tests in various localities, all the installations being unrestricted as to hours of heating. The extreme variations appear to be due to variations in the number of heaters installed in the measured groups and other local conditions. A study of the prevailing

Table I—Summary of Tests by N.E.L.A. Water Heating Committee

The average number of persons per family in the different survey localities was: Alabama, 5.33; Florida, 4.13; Rockford, 3.71; Maine, 3.94; Salt Lake City, 4.08; giving a group average of 4.24.

Project	No. Heaters	No. Elements	Element Rating in Kw. No. 1	No. 2	Total	Average Max. Indiv. Demand, Kw.	Max. Group Demand, Kw.	Diversity Factor	Per Cent Demand Factor	Average Max. Demand Kw. After Diversity	Average Kw.-Hr. per Week	Per Cent Weekly Load Factor
Seattle (1).....	14*	1	...	...	3.5–4	3.58	31.70	1.58	63.5	2.27	79.0	20.8
Seattle (2).....	25†	1	...	...	3 –4	3.69	25.37	3.64	27.5	1.01	35.2	20.7
Seattle (1).....	50*	1	...	...	3.5–4	3.58	72.21	2.48	41.5	1.44	78.4	32.3
Seattle (2).....	56†	1	...	...	3 –4	3.69	50.95	4.78	21.4	0.77	34.6	26.7
Florida.....	60	1 and 2	1.5	1.5	3	3.02	68.88	2.72	36.8	1.11	50.7	27.2
Alabama.....	60	2	0.5	1.0	1.5	1.53	55.04	1.67	60.0	0.92	85.8	55.5
Rockford.....	60	1	...	...	3 –6	4.6	93.04	2.97	33.7	1.53	39.3	15.1
Rockford.....	40	1	...	...	3 –6	4.72	73.96	2.50	41.86	1.89	51.2	15.4
Salt Lake.....	60	2	1.0	1.0	2.0	1.27	41.60	1.83	34.7	0.69	69.3	59.8
Salt Lake.....	44	1	1.0	...	1.0	1.0	31.40	1.40	71.4	0.71	62.8	52.4
Maine.....	60	2	0.5	1.0	1.5	1.44	53.40	1.61	62.0	0.89	80.4	53.9
Elk Grove.....	10	1	...	...	2 –4	3.18	15.50	2.05	48.7	1.55	25.2	9.7
San Joaquin.....	10	1	...	...	3 –5	4.20	19.00	2.21	45.2	1.90	48.6	15.2
Columbus.....	8	1 and 2	...	...	1 –5	2.45	13.96	1.40	71.3	1.75	71.7	24.5

*Insulated. †Uninsulated.

Table II—Water Use in Four Localities

The tank installations were as follows: Alabama, twelve 60-gal. and 48 30-gal. tanks; Maine, 50 gal. each; Salt Lake, average 40.34 gal.; Rockford, average 16.6 gal. (Rockford had clamp-on heaters only.)

Project	Average Temp. Rise Deg. F.	Average Number					Energy Consumption Kw.-Hr.		Average Gallons Per					
		Persons	Rooms	Bath-rooms	Faucets Hot	Faucets Cold			Home	Person	Room	Bath-room	Faucet Hot	Faucet All
Alabama	86.52	5.33	6.77	1.43	3.92	5.4	Maximum	17.56	59	11.1	8.71	41.26	15.05	6.33
							Minimum	7.15	18	3.4	2.66	12.59	4.59	1.93
							Average	12.26	44.5	8.3	6.57	31.14	11.35	4.77
Maine	91.12	3.94	8.2	1.12	4.23	4.23	Maximum	16.63	54	13.7	6.59	48.21	12.77	6.38
							Minimum	7.83	18	4.6	2.2	16.07	4.26	2.13
							Average	11.53	35.2	8.9	4.29	31.43	8.32	4.16
Salt Lake City	86.25	4.08	5.4	1.08	4.05	5.58	Maximum	15.41	45.6	11.2	8.44	42.22	11.26	4.74
							Minimum	5.13	12.0	2.9	2.22	11.11	2.96	1.25
							Average	9.61	28.3	6.9	5.24	26.2	6.99	2.94
Rockford	89.14	3.71	7.1	1.15	4.83	5.08	Maximum	12.45	34	9.2	4.79	29.57	7.04	3.43
							Minimum	3.13	8	2.2	1.13	6.96	1.66	0.81
							Average	5.66	15.2	4.1	2.14	13.22	3.15	1.53

medium data gives a better weighted average idea of the performance to be expected than do the maximum and minimum figures shown.

Table II summarizes the use of water per day for the test sites in Alabama, Maine, Salt Lake City and Rockford, with data upon the temperature requirements, relation between size of families, number of rooms, faucets and energy consumption.

Recent developments in electric water heater design have made available heaters that can be used equally well on unrestricted or controlled services with high efficiency. If load conditions change or rate modifications seem advisable no change in the style of heater is necessary.

The new method of staggered control promises a large and profitable load to some companies at a price attractive to the customer. It avoids creating unnecessary peaks where valleys now exist. By selecting the right design and tank sizes it is practicable to furnish the best of service with charging periods not exceeding twelve hours out of 24. The twelve hours may be divided into two or more periods, separated so that two customers using about 4,000 kw.-hr. each per year can be served per kilowatt of demand at the generating station. Therefore such a control makes possible the sale of 7,000 to 8,000 kw.-hr. per kilowatt generated under proper conditions. Most of the energy supplied will be on the basis of off-peak cost. The water heating earnings will prove more dependable than the comparatively low load factor and lower power factor industrial loads. Dependable time controls of both self-winding and synchronous types are now available at practicable prices.

All of the tests by the committee were of unrestricted service permitting demands across system peaks. The lowest after-diversity demand for any type of heater ranged from 690 watts with a comparatively low water usage to 890 watts with a high use. Data available in this country and abroad indicate that additional capacity is required when an unrestricted water heater is added to a system, even though a double-throw switch or relay is used.

Table III—Water Heating Energy Consumption at Hartford

(Kw.-Hr. January, 1931)

Persons per Family	2	3	4	5	6	7	8	9	10
No. heaters observed	39	53	49	36	27	23	15	6	2
Maximum	593	613	707	1,445	1,132	1,199	1,199	1,120	1,329
Minimum	112	167	175	158	202	202	325	495	925
Average	320	342	430	602	695	750	816	830	1,127

Table IV—Virginia Off-Peak Water Heating Results

Classified According to Size of Family
225 50-Gal. Tanks, 1,277 Consumer Months

Number of persons in family	2	3	4	5	6	7
Number of heaters observed	49	58	59	30	18	11
Number of consumer months	386	342	317	177	101	61
Average of maximum monthly kilowatt-hours	351	378	403	430	465	518
Average of all monthly kilowatt-hours	286	306	326	347	376	418
Excess of maximum over average	65	72	77	83	89	100
Per cent excess	23	23	24	24	24	24
Average kilowatt-hours per person per month	143	102	82	69	63	59
Average number of persons in family					3.76	
Average kilowatt-hours per month					326	
Average kilowatt-hours per person per month					87	

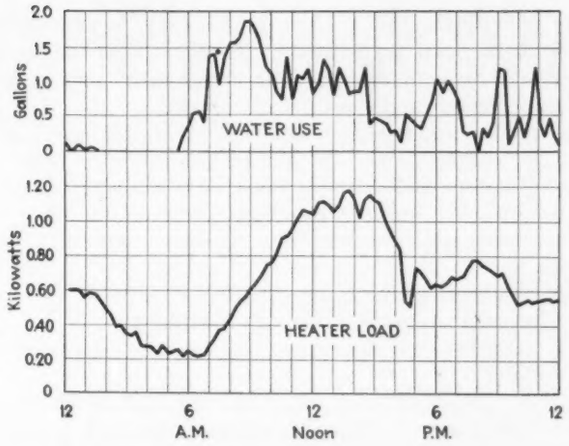
Attractions of controlled service

The first off-peak heaters were installed in 1916 at Basle, Switzerland; by 1929, 6,100 heaters with an installed capacity of 12,500 kw. were in service and a load factor increase from 56 to 74 per cent had been realized. Independent control is now used in England, New Zealand and the United States. The committee points out that controls should always be connected on the service side of the main switch. Present indications are that the cost of carrier-current control will not exceed $20 per unit where the cost of the transmission equipment varies between $2,500 and $8,000, depending on the design of the distribution system, the number of controllers and different types of load to be controlled.

If the problem is approached carefully and a rate extended which is based on one-half normal demand and a load factor between 80 and 90 per cent there need be no fear of the possibility of building up a peak when the staggered system, coupled with off-peak control, is used.

Although the committee was unable to test controlled service installations on account of their relatively small use in this country during the investigation, the report includes information of value from several operating companies selling off-peak water heating. Condensed notes from this section of the report follow:

Hartford Electric Light Company—This company was the first to employ a water heater using a combination off-peak and unrestricted service. It serves 60-, 100- and 150-gal. tanks with two units, each rated respectively at 2, 3 and 4 kw. for the corresponding sizes of tanks. The annual rental charge is $36 for the 60-gal. tank, $42 for the 100-gal. tank and $48 for the 150-gal. tank. In each case the company adds an energy rate of 1 cent per kilowatt-hour and maintains a monthly minimum charge of $1. Only one heating element is in service at a time in any tank, and the regular charging periods are governed by synchronous motor control; 12 to 14 per



Corresponding average water use and heater load in Maine

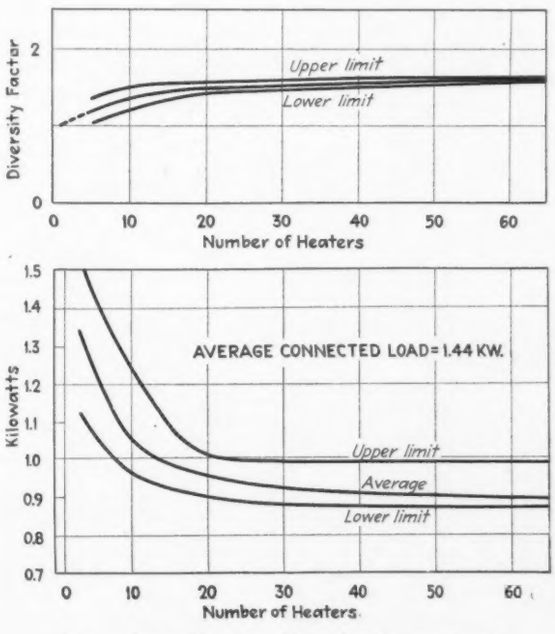
cent of the total energy used is supplied outside the regular off-peak charging period of from 11 p.m. to 7 a.m.

The size of tank is determined by an examination of local conditions and is based primarily upon the index number of "persons" in the family, under which each servant counts as two persons. For two and three persons 60-gal. tanks are provided, 60- or 100-gal. tanks for four persons, 100-gal. tanks for five and six persons, 150-gal. tanks for seven to nine persons inclusive and 150- and 60-gal. tanks (double installation) for ten or more persons.

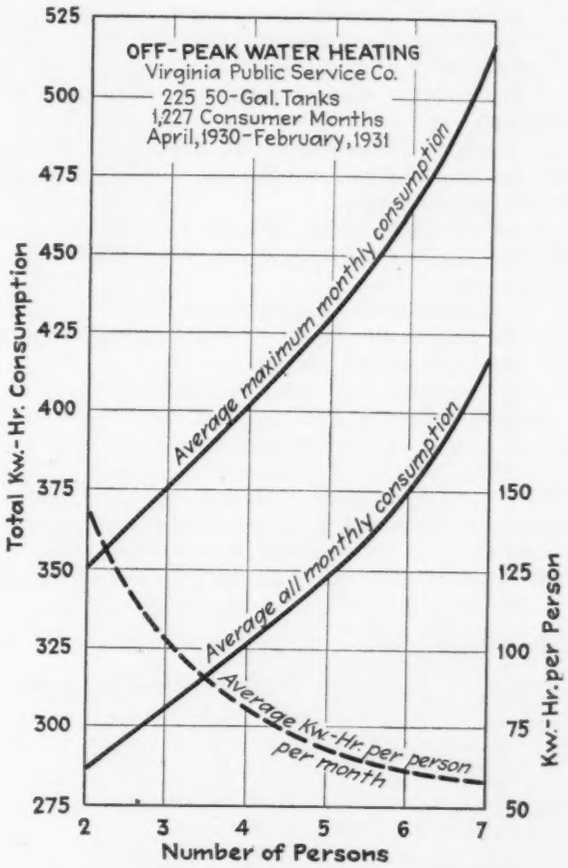
In January, 1931, there were 240 installations at Hartford and the average energy consumption per 60-gal. tank was 350 kw.-hr. for the month; 100-gal., 572 kw.-hr.; 150-gal., 752 kw.-hr., and 210 gal., 901 kw.-hr. Table III gives the water-heating energy consumption at Hartford for different-sized families in January last.

Virginia Public Service Company—The Virginia Public Service Company sold 413 off-peak heaters between March, 1930, and March, 1931, giving 867.3 kw. connected load at an average energy consumption of 344 kw.-hr. per month. The tanks are of 50- or 100-gal. rating with single 2- or 3-kw. elements. The energy charge is 1 cent per kilowatt-hour, and there is a service charge of 50 cents per month per kilowatt of connected capacity. Table IV gives the energy consumption of 225 50-gal. tanks on this system over a period of 1,277 consumer months.

Iowa Railway & Light Corporation—Records of 107 off-peak installations covering twelve months' usage, mainly from 90-gal. tanks with 2-kw. heaters, show a minimum energy consumption of 1,236 kw.-hr. per year



Diversity and after-diversity demand of Maine heaters

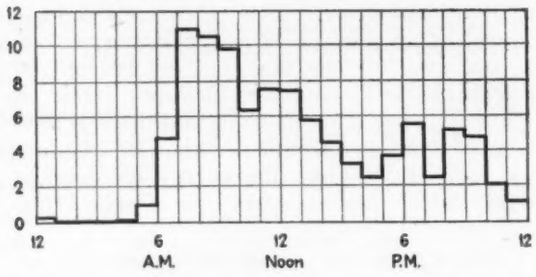


Average energy consumption per person for off-peak heaters in Virginia

at an average cost per month of $2.78, and a maximum of 9,129 kw.-hr. (4.5-kw. units) at an average cost of $8.26 per month.

Based on the results of the survey, the committee makes the following suggestions to those interested in promoting water heating:

1. Since the average customer was found willing to pay between $3 and $5 per month and use between 3,000 and 4,000 kw.-hr. per year, it is suggested that rates which will fulfill these conditions be considered.
2. The possible application of "controlled service" should be carefully considered.
3. Complete hot water service should be stressed and intermittent use of heating discouraged.
4. Installation should be carefully supervised by an especially qualified man.



Hourly percentage water draw-off for average day

5. Particular attention should be paid to piping. Heaters should not be installed in circulating piping systems.

6. Pressure and temperature relief valves should be installed wherever practicable.

7. The reliability of thermostats should be carefully investigated.

8. For average conditions the size of the element should not exceed 2 kw. and the size of the tank should never be under 30 gal.

9. Some allowance should be made for increased water usage due to the superior service offered by electric water heating.

10. It is suggested that the temperature of the hot water delivered to the faucet be not less than 130 deg. F. and need not exceed 140 deg. F.

The committee is convinced that although great care and carefully planned and executed work are needed, there is a greater and more satisfactory field for development than hitherto realized by the industry. The evident collateral advantages of such service will enable competent, well-supported salesmen to make large sales, especially if they have electric hot water in their own homes. Due to their many advantages, electric heaters can be profitably installed in natural gas territory.

The successful sale of real hot water supply is a specialty job requiring more than usual ability, together with real knowledge of the worth of the service and the appliances needed to insure it. The omission of any of the following basic conditions spells failure:

(a) Rates must be low and such that customers can afford a complete and satisfactory hot water service.

(b) Heaters and controls must be strictly up to date and require the lowest investment both on the part of the customer and the company consistent with the best service.

(c) Installed prices must usually be not over $175 to $200 for equipment of maximum usefulness.

(d) Ten per cent down and long-term payments must be available.

(e) Sales forces must be competent and every prospect carefully surveyed, rejecting those which are unsatisfactory. (Each satisfied customer brings another and one dissatisfied spoils a dozen prospects.)

The lower the prices for a first-class job the broader the market. It is the $4 to $5 per month market that makes large saturation possible, bringing satisfactory results and continuous revenues over long periods. Last, but not least, the service company management taking full responsibility for the development of profitable water heating will profit most.

The fact that the committee has been unable as yet to find a single satisfactory development of electric water heating, even with low rates, where the service company has not accepted the responsibility for sales development, is an indication that water heating must receive the best of attention from local management. One successful company not only assumes sales responsibility but also offers conditions that insure co-operation. In this case 15 per cent was allowed for dealer sales. Dealers can purchase and install standard heaters at 30 per cent discount, and carry the account. In case the company carries the account, the dealer receives but 25 per cent discount and is still happy.

Table V—How Salt Lake City Data Were Recorded

Site	Heater Data		Family Data				House Data		Outlet Data			Piping Data				Hot Water Uses			Water Data			Energy Data
												Kitchen		Bath					Water Temperature			
	Rating, Kw.	Tank Size, Gals.	Profession or Business	Adults	Children	Servants	Rooms	Baths	Hot	Cold	Showers	Length, Feet	Size, Inches	Length, Feet	Size, Inches	Clothes	Dishes	Baths	Deg. F In	Deg. F Out	Average Gals. per Day	Average Kw.-Hr per Day
1	2	30	Bank teller	2	4	..	4	1	3	3	..	10	½	25	½	Machine	Yes	Tub	63	170	17	7.42
3	2	40	Refrigeration company	2	3	..	5	1	4	6	..	15	½	25	½	.....	Yes	Tub	..	...	..	7.17
4	2	40	Power company	2	2	..	4	1	3	5	..	30	½	25	½	Machine	Yes	Tub	65	...	..	7.89
5	2	40	Power company	2	..	..	4	1	3	5	..	15	½	15	½	Hand	Yes	Tub	50	155	16	7.27
6	2	40	Grocer	2	4	..	5	1	4	4	..	10	½	25	½	Machine	Yes	Tub	..	...	..	14.06
7	2	40	Sign painter	2	2	..	4	1	3	5	..	30	½	30	½	Machine	Yes	Tub	..	...	..	10.51
8	2	40	Barber	2	..	..	4	1	4	6	..	12	½	15	½	.....	Yes	Tub	..	...	..	8.23
9	2	50	Retired	2	..	..	4	1	4	6	..	20	½	30	½	Machine	Yes	Tub	65	168	14	6.47
10	2	..	Shoemaker	4	..	..	4	1	2	3	..	20	½	20	½	.....	Yes	Tub	..	...	..	9.35
11	2	..	Author	7	..	..	4	2	6	8	..	60	½	90	¾	Hand	Yes	Tub	..	...	..	10.40
12	2	40	Salesman	2	1	..	5	1	5	5	..	20	½	25	½	Machine	Yes	Tub	63	164	32	14.11
58	2	40	Sec. Elec. League	2	2	..	4	1	3	5	..	20	½	10	½	.....	Yes	Tub	61	...	..	1.13
60	2	30	Glazier	3	1	..	5	1	4	5	..	25	½	25	½	.....	Yes	Tub	64	142	21	8.94
62	2	40	Mailman	2	2	..	5	1	4	6	..	7	½	24	½	Machine	Yes	Tub	62	145	48	14.27
65	2	40	Power company	2	3	..	5	1	4	6	..	30	¾	20	¾	Machine	Yes	Tub	62	...	..	3.19
66	2	40	Theatrical man	3	..	..	5	1	3	5	..	8	½	20	½	.....	Yes	Tub	67	168	25	9.19
67	2	40	Salesman	2	2	..	6	1	4	6	..	20	½	30	½	.....	Yes	Tub	64	145	30	10.22
70	2	40	Teacher	2	..	..	4	1	4	6	..	20	½	20	½	Machine	Yes	Tub	59	...	..	2.84
73	2	40	Buyer	3	..	..	6	1	4	4	..	30	½	15	½	.....	Yes	Tub	66	...	..	3.69
Aver.	**2**	**40.34**	.....	**2.68**	**1.33**	**0.07**	**5.4**	**1.08**	**4.05**	**5.58**	**0.22**	**19.48** **23.94**	½ ¾	**26.98** **37.50**	½ ¾	.....	.....	.....	**63.29**	**144.0**	**33.4**	**9.67**

Electrical World Has a New Home

EDITORIAL staffs, mechanical production departments, executive officers and all service divisions of McGraw-Hill have now completed moving to the McGraw-Hill Building, 330 West 42d Street, New York. The co-ordination of facilities and the complete modernization of production elements which this move brings means a greatly improved service to the readers of ELECTRICAL WORLD and other McGraw-Hill papers.

Here in one building, planned for unified publishing action, are all the elements of the most modern business-paper production. More timely reporting of current news, improved appearance of issues and the editorial inspiration which a new home and unsurpassed surroundings bring will be among the benefits realized by our readers as the result of this move. Views of work areas in the new building appear on the two following pages.

At "Electrical World" editorial headquarters

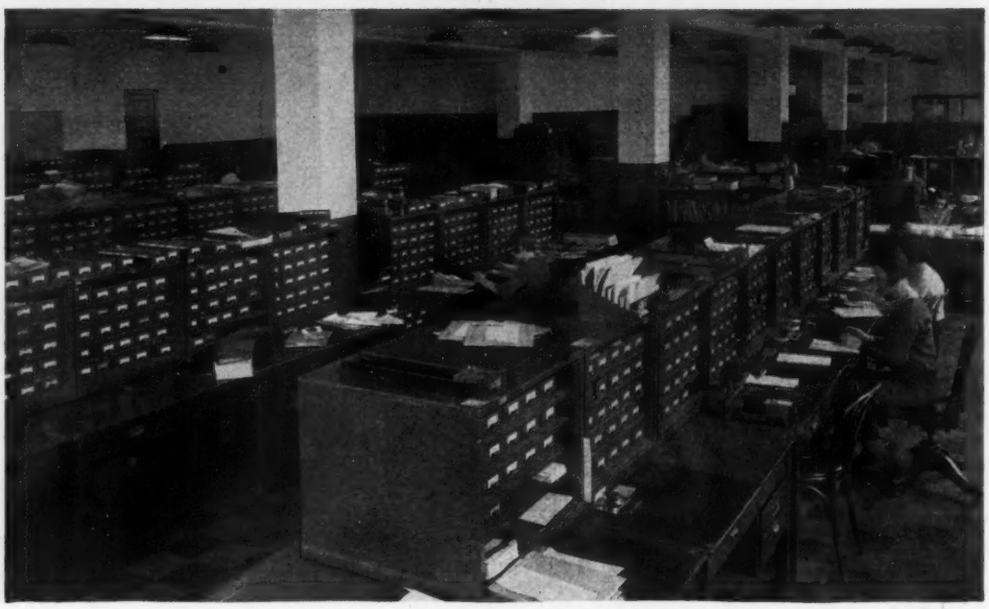
In the foreground are members of our staff at work; editors, assistants, make-up man and secretaries. In the background are the offices of the publishing director, editor-in-chief and other editors.

Statistical and advertising divisions

The statistical editor and his staff of assistants as well as the representatives of the business department are located where sunlight and air are available in abundance.

Circulation records

If you are a subscriber to ELECTRICAL WORLD or some other McGraw-Hill publication your name appears on an addressograph stencil in one of these trays. More than 600,000 such stencils are maintained, checked and used as issues are published.



High-intensity lighting aids

In the composing room good lighting has been carefully studied. It is here that page forms are assembled.

Press room with high-speed equipment

Time delays are cut to the minimum under a close schedule of production which insures a promptness of news service virtually unrivaled in magazine publishing. Thirty-three of these presses speed McGraw-Hill publications to the readers.

Utilities Denounced and Upheld

Speakers from "both sides of the fence" aired their views on vital utility problems at the Philadelphia meeting of the American Academy of Political and Social Science, November 6 and 7.

The field and function of holding companies, rates, regulation, valuation, public vs. private ownership and the electrical future were topics of six sessions, in which nineteen speakers participated.

SUFFICIENT extremes and gradations of viewpoint were expressed on utility topics at the Philadelphia meeting of the American Academy of Political and Social Science, November 6 and 7, so that the so-called "radical," conservative or progressive listener could nod his head in acquiescence to comments made. To a person brought up in the utility industry some of the discussions indicated a lack of knowledge or conclusions reached without considering all facts. And doubtless a person of opposite experience might feel that the minds of some speakers were closed to the necessity of any change because it was impossible in the short time available to bring out all the factors that contribute to the *status quo*. Because the proponents of change were in the majority and could appeal to their cause by generalities or emotions, they had the advantage over those who defended the utility cause. Nevertheless, sitting through the entire meeting, in which nineteen speakers participated, was a broadening experience. While an unbiased inquiring listener might not have found the answers to all questions raised by the discussion, he at least would hesitate to reach definite conclusions immediately and would be tempted to weigh values and give the subjects much more study before leaping into the dark.

The field and function of holding companies, rates, regulation, valuation, public vs. private ownership, and the electrical future were each given an entire session for discussion.

Field and function of holding companies

"Fortunately or unfortunately," said Prof. J. C. Bonbright, Columbia University, "the holding company has become an integral part of American public utility enterprise, and the practical issue today is that of its regulation rather than its destruction.

"The first and most essential need is for a revision of the public service laws, subjecting the books and accounts of holding companies and other affiliated companies to the same publicity and to the same uniform accounting provisions to which the accounts of operating companies are already subject. The second need is for the development of rational plans of public utility consolidations under laws similar to the consolidation provisions of the transportation act, applicable to combinations by means of a holding company no less than to outright mergers and amalgamations. The third need is for the abolition of intercompany transactions yielding an unregulated profit to the holding company or to an affiliated service company. It is to be hoped that the industry itself will make this adjustment, but if it does not do so, mandatory laws will be required. Possibly a fourth need is for commission regulation of holding company securities. On this point, however, I am not as clearly convinced as on the other points and it seems to me that action here may wisely be postponed until the results of the preceding measures of control have had a chance to prove their effectiveness."

"There is nothing wrong with a holding company which serves to tie in operating companies and give them efficient advice, but the pyramided structure of holding companies holding other holding companies, and themselves in turn being held by others, should be wiped out," said John T. Flynn, of New York, noted writer on economic subjects.

"I believe in the corporate form of doing business," he continued, "and I believe in large corporations rather than small ones and look upon the development of large-scale business not only as inevitable but under all the circumstances as desirable. But those who are so fond of talking about government interference in business would do well to pause and remember that the most tremendous and far-reaching interference in business which the government has ever undertaken has been the creation of the corporation itself. In the corporation the government has actually tried its hand at creation and set up a distinct entity which operates as a person with almost all of the civil rights of a person and only some of the human being's obligations. The government, having created this thing, is bound to be sure that it does not exceed the purposes and necessities of its creation. Whether corporations now should be permitted to come together like citizens and create another corporation in which they own stock is a very serious question and in my opinion should be curbed.

"Therefore, I urge a commission in which will be represented the American Bar Association, the American Economic Association and the American Bankers' Association which will collaborate in a study of our corporation law system with a view to correcting the evils which have grown up."

W. H. Hodge, vice-president H. M. Byllesby Engineering & Management Corporation, expressed the opinion that we shall not get very far toward a solution of the problems that vex us by a catalog of defects on one hand and a catalog of virtues on the other. "What

we are most interested in," he declared, "is trying to find a common meeting ground where errors will be confessed and suggestions toward improvement sympathetically considered.

"The present mood of universal pessimism and criticism must give way to a period of conciliation; a spirit of understanding, tolerance, forbearance, Only from such a mood can we hope for the outgrowth of better things.

"It may be true that abuses have crept into the holding company, and that when these abuses reached a certain volume the effectiveness of this instrument declined. We may grant this, and at the same time not lessen the force of the contention that the holding company has been and is a medium of the greatest value to mankind. To continue its usefulness the remedy would appear simple; amputate the abuses. Either this, or find and suggest a better way of harnessing and directing the brains, resources and ideals of those possessing the creative forces.

"Practically all kinds of large business enterprises now employ the holding company plan. But the utility holding company has been particularly singled out for criticism.

"What I would like to know," questioned Mr. Hodge, "is why a chain of utilities should be considered any more iniquitous than a chain of newspapers; why should the holding company plan of control be denounced as against public interest in the case of the utilities and held consistent with public welfare when applied to newspapers.

"My principal objection to federal regulation is based on apprehension, first, that federal regulation, while it may end isolated abuses, may definitely impair the initiative, resourcefulness, mobility and efficiency of the holding companies—in other words, handicap, if not destroy, their beneficial powers; second, that federal regulation will inevitably cause friction and confusion with state regulation; third, that in this conflict between federal and state regulation, the federal powers will eventually dominate and control, more and more dwarfing regulation by and in the commonwealth."

Rates

Harold Evans, former member of the Pennsylvania Public Service Commission, declared:

"A comparison of domestic rates in various parts of Pennsylvania shows that for an average consumption of 40 kw.-hr. per month they vary from 5.3 cents in some of the western and southwestern counties to 9.2 cents in the hard coal fields and adjacent territory and reach a maximum of 14.6 cents in Fulton County. Differing rate policies of the operating companies rather than differences in cost of service account for most of this difference.

"Domestic rates average about 4¼ times wholesale power rates, but still the residence business is no longer a peak load. Taxes paid by utilities average only ¼ cent per kilowatt-hour, but it is quite likely this burden is borne principally by domestic customers.

"The domestic load is the backbone of the industry. In spite of the depression it has continued to increase. A $22,000,000 loss in power revenue in 1930 was more than offset by a $43,000,000 gain in domestic revenue. As between the small householder and the large it appears the former is bearing more than his fair share of the load. This can be rectified by materially lowering the rates in the highest brackets."

On the basis that full use of electricity in the home would consume about 3,000 kw.-hr. per year per domestic customer and justify a rate of about 2 cents, Leland Olds, Power Authority, State of New York, contended that utilities should now offer a rate of 2 cents per kilowatt-hour and the load would increase to this value, benefiting the customer and company alike. He maintained that the real reason for the differential between wholesale and domestic rates is that industrial business is secured on a competitive basis, whereas domestic business is secured on a monopolistic basis.

Discussing discrimination, Edwin Gruhl, vice-president and general manager North American Company, presented 31 pages of answers to critics of the utility industry, most of which were quotations from previous answers. Forty-seven references were given in support of his statements. Among the topics discussed were cost and value of service, influence of demand, density and diversity, cost analyses, the differential between industrial and domestic rates, the ratio of distribution costs to production costs, the non-profitable consumer, the danger of using averages and discrimination by government bodies.

"The price charged for any service or commodity in any business must conform to a dual standard if the business is to survive and prosper. It must not be more than the value of the service or commodity or the customer will not purchase. It must not be less than the cost of the service or the undertaking cannot long continue to produce. Both of these standards are recognized by our commissions and courts as limiting factors in determining reasonable rates. There is no legal requirement that the element of profit must be identical in each class of service rendered. Class rates are offered from necessity—that of getting the business. So a class rate must cover class cost and, in accordance with both good equity and sound economics, out-of-pocket losses must not be incurred in one class of business and saddled upon other classes.

"Constructive regulation recognizes that rates must be designed to encourage off-peak business, and thus improve demand; designed to encourage more customers and more wholesale business, and thus improve density; designed to meet the value of service test in every sphere of usefulness to which electricity can be put, and thus improve the diversity. Such a rate policy means more business, cheaper cost, lower rates."

Denying the accusation that there has been an atmosphere of mystery created around distribution costs, Mr. Gruhl contended that there has been an extensive list of literature dealing with the subject since 1892 and available to the public. The classification of accounts of utilities does not merge the cost of the entire process of rendering service, but breaks it down into its logical components. In no other business, except railroads, are costs such an open book.

"The principal reason for large and widespread distribution systems, generally representing two-thirds

of the investment of public utility companies, is the fact that there are many small customers, and that very much smaller capital expenditures and operating costs would be involved were it possible to sell the same amount of service to large wholesale customers.

"The problems of apportioning common expenses present a complex picture, requiring special analysis in each particular case. But such analyses are no more complicated than those involved in many other businesses."

Commenting on the differential between residential and industrial power rates, Mr. Gruhl pointed out that the analysis of the Giant Power Board of Pennsylvania showed that the domestic consumer barely pays his fixed charges, and that the spread is not peculiar to the electric industry, the price of a retail commodity often being five to six-times that of the wholesale price. He also pointed out that the average residential sales price is only 4¼ times the average price for industrial power.

Referring to Ambassador Sackett's comments on cost of distribution, Mr. Gruhl considered them more as inspiration to engineers to change methods of distribution rather than as evidence of discrimination. Considering all costs, the average spread between residential price for energy and the cost of producing it is less than 5:1 and not 15:1. Quoting from a national report of utility commissioners, he said:

"The domestic customer with an annual consumption of between 500 and 1,000 kw.-hr. is paying slightly less than the cost of serving him, while those with consumptions of 1,200 per year or over are paying somewhat more than their share of the costs. Based on 40 customers per mile, an average community situation, the report shows a total cost, excepting generation, but including fixed charges, of 11 cents per kilowatt-hour for annual consumption of 400 kw.-hr. per year ranging down to 1 cent for annual consumption of 2,700 kw.-hr., a spread of eleven to one."

The small customer who demands but does not use service, who requires facilities that are in idleness most of the time, is our common problem.

Senator Norris was cited as one utility critic who once declared he would use four times as much energy if his rate had been 4 cents instead of 10 cents, but who after securing such a low rate used less rather than more energy.

Although it has been denied that Ontario industries are penalized to subsidize small users, Professor Mosher's book on utility economics was quoted to show that a Toronto power customer using 2,000 kw.-hr. a month at 28 per cent load factor was paying a higher rate than a residential customer, using 175 kw.-hr. at 6 per cent load factor.

"There is no proof that a government-owned electric department would distribute exact justice among different classes of customers, because the 1930 cost analysis of the Post Office shows that the first-class mail not only pays its own way but carries a portion of the burden of all other classes."

Absolutely equitable rates would require a different rate for every customer, W. S. Lee, president W. S. Lee Engineering Corporation, admitted, but this is impracticable and class rates have to be established for groups having similar requirements. Service to the industrial group is the cheapest to perform per unit due to the fact that power customers are more or less steady in consumption, run long hours, consume large amounts of energy and have a far lower unit cost of installation, maintenance or service requirements than the domestic or commercial. He cited the wholesale and retail prices on several commodities to show that a wide difference exists in nearly every field, and that the electric service is not unique in having differentials between classes of business.

Regulation, federal and state

Governor Pinchot continued his attack on utilities, repeating many of the comments which he has made before. He declared that the unemployment situation will not interfere with his further attempts to enforce more stringent regulation on utilities, saying that his efforts would be redoubled because of the operations of holding companies.

"Certainly one of the main problems is to reach beyond the operating companies to the corporations which hold, own and control them. Because of the nation-wide character of industrial control, this cannot be done by individual state commissions. It cannot be done by state compacts. It can be done, and it can be done only, by the federal government supplementing the powers of the state.

"Even states joined by compacts could not get at the books of a holding company operating in those other states outside the compact. Nor will states under compact have any power over the securities of an interstate corporation in so far as they affect its properties in foreign states. In short, there is nothing in the problem of utility control outside of interstate transmission of energy which a compact could adequately handle."

Federal regulation of power companies that do an interstate business was opposed by Col. William J. Donovan, former Assistant Attorney-General of the United States. He urged that regulation be left to the states, on the ground that "one of the fundamental principles of our government is that local problems can best be dealt with by locally constituted authorities readily accessible to the public they serve and most familiar with the problems involved."

Referring to the control of interstate transfer of energy, he maintained that a state has power to inquire into costs and that a state commission has the right to "refuse to approve a contract which was improvidently entered into and which called for the payment of excessive charges by the local company."

Watering of securities by holding companies could be dealt with, he declared, by the states individually, under Blue Sky legislation and by control over issuance of securities of the operating companies. By mutual legislation states could honor the process of subpœna issued by another state, thus facilitating the obtaining of evidence in public utility cases.

In matters regional rather than local in their nature the states concerned can undertake by agreement to deal collectively. Use of this "compact" method in settling the Boulder Dam relations of the states was cited.

Valuation as a help in regulating public utilities is of minor importance, declared H. C. Attwill, chairman of the Massachusetts Department of Public Utilities.

"Instead it has been the endeavor in Massachusetts to control the issue of securities of public utilities so that the capital stock will fairly measure the cost of the property employed by the utility, and to be guided largely, but by no means entirely, in the fixing of rates, by that investment.

"The law in Massachusetts contemplates that the stock of the utility shall be issued at not less than its par value. This requires the state authority, in the interest of the public, to so regulate the rates that the utility, under reasonably prudent and honest management, will be able to pay dividends on that stock, so that new issues of stock will find a ready market. So long as we have reasonably prudent and honest management, and the dividends paid are not more than is necessary to secure a ready market for new issues of stock, the interests of the public and the stockholders are not seriously in conflict. The public desires the service. The utility cannot supply the service unless it can obtain the necessary capital. This it cannot obtain unless the investors, who are to furnish the capital, are assured that they will receive a reasonable return upon the capital they furnish. On the other hand, it has not been the idea in Massachusetts that the return should be fixed entirely upon the capital invested. Consideration must be given to the manner in which the utility is and has been managed, whether it has built up a surplus and made adequate provisions for depreciation, or has paid out all its earnings in dividends, and also to the fact that there should be an incentive and a reward for superior management."

Objections to valuations

Six objections to valuation as a rate base were cited by Mr. Attwill. Stated briefly, they are: (1) It slows up regulation and in great measure makes it ineffective; (2) it is costly; (3) it includes depreciation reserve as a basis of return; (4) it gives a value much in excess of the cost of the property; (5) it substitutes the judgment of a master appointed by the court for the state commission; (6) it is an incentive to inefficiency.

The so-called "valuation controversy" seems to have lost a good deal of its vigor and vitality, declared W. L. Ransom, chairman public utility law section American Bar Association. "State regulation of rates can be and is being made effective in states which are willing to create able commissions with adequate appropriations and staffs. Extensive rate reductions are being brought about by commissions and rates are being kept reasonable with no serious obstacles interposed by judicial decisions on valuation.

"No theory of valuation or the 'rate base' would protect the public interest, if intrusted to a mediocre mission without competent personnel. I have never seen any theory of valuation curb or impair the work of a vigilant commission which has assembled an alert, fair-minded and experienced staff.

"One of the most regrettable phases of our contemporary politics is that so many of the executives and legislators who are most vehement in denouncing the 'breakdown' of regulation and in demanding the establishment of concepts rejected by the courts are at the same time most derelict in awarding to the commissions the technical staffs without which no thory or system of rate revisions or the 'rate base' could be administered in the public interest."

Public or Private Ownership?

A plan providing for government ownership and operation of the nation's railroads and other public utilities in place of the present system of private ownership under government regulation, which results in a "divided responsibility," was proposed by Commissioner Joseph B. Eastman, Interstate Commerce Commission.

"Public ownership," said Mr. Eastman, "need not be combined with public operation. It is quite possible to contract for private management, and to provide in the contract such definite safeguards against exploitation and abuse as may be desired. Personally I incline toward public operation as well as ownership. But such operation need not be through an ordinary government department or bureau. Instead it can, and I believe should be, carried on, just as private operation is carried on, through the medium of a separate corporation, with the government as the stockholder.

"Such a system," he explained, "would at one stroke eliminate the troublesome question of valuation, greatly simplify financing, largely eliminate the courts as a time-consuming factor in the situation, and reduce cumbersome judicial procedure in connection with questions of management to a minimum."

Taking up the major arguments used by proponents of government ownership, namely, that capital can be obtained more cheaply, profits can be eliminated, excessive salaries can be avoided and social benefits will be obtained, Samuel Ferguson, president Hartford Electric Light Company, discussed each one in detail to show that they have been given undue weight. For instance, he showed that even by paying 12 per cent dividends on stock one company only collected 7/10 cent per kilowatt-hour from its customers in the service charge. If the entire capital had been secured with 4½ per cent bonds this item would have amounted to 3/10 cent per kilowatt-hour, or only ⅖ cent less. The difference would have been less if the company had not been financed entirely with common stock.

In general, the taxes charged utilities amount approximately to 10 per cent of their revenue, and substitution of government operation would result in redistributing the collection of this amount over other sources of revenue. Regarding salaries, he said they may look large to the public, but who can say that the same benefits which today are enjoyed by the public could be obtained by reliance on the "service motif" for progress.

"Whatever affects electric utilities for good or ill will influence our electrical future, and consequently our economic development and social well being," asserted M. S. Sloan, president New York Edison Company.

"With the reduction in prices which is bound to continue over a period of years, I cannot see any limit to increased use of electricity unless and until science produces some form of energy which will do things better and cheaper. Twenty years hence electricity will be used in quantities which will make today's usage seem puny, and for purposes not easily practicable with present prices.

"There is opportunity for considerable reduction of costs between the generating plant and the customers' meters. Delivery of power, relatively speaking, is expensive today, while generation is not. Line and transformer losses between the plant and the meters average from 15 to 30 per cent of the current generated. The investment in substations, transmission and distribution lines, transformers, meters is very heavy. Networks are peculiarly adapted to cities with underground distribution systems, but there is no reason I can see why they are not applicable to smaller communities. I expect to see them come into wide use and prove an important element in producing reduced costs, hence in reducing rates over large areas of the country.

"Houses will be built completely equipped with electrically operated machinery to do all the hard and the dirty jobs. Conveniences and refinements of living, now only being introduced under exceptional circumstances, will become general. Lighting will be of far higher intensity, and will yield rays approximating sunshine. Cooking, water, heating, even house heating by electricity will become far more general as the low price levels permit electricity to compete with other agencies. Every large building, including apartment houses, will have its air supply conditioned. Equipment to do a similar job for individual houses will undoubtedly be within the reach of people in modest financial circumstances.

"Farms, as a class, are destined to become valuable customers because of their many uses for current in the home and for farm tasks."

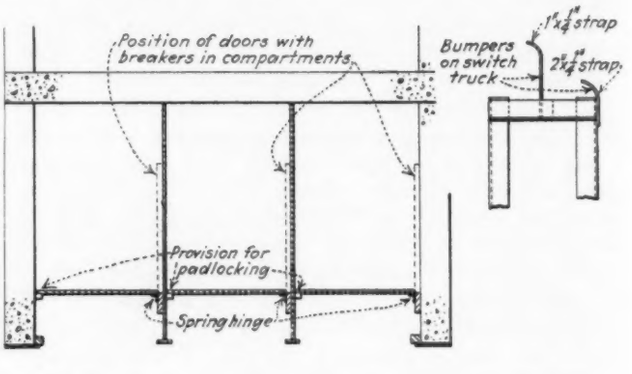
Electricity will replace steam generally as a motive power for railroads, and street traffic conditions will bring about larger and faster street cars and a revival of that business. Streets, parks, public places, and country highways will be illuminated way beyond present standards.

"To reach such a stage of development," Mr. Sloan reminded, "will involve changes in corporate structures and utilities' relations with government agencies. The tendency to merge contiguous operating companies and simplify corporate structures should and will be continued as a matter both of good business practice and good public policy. As the utility industry progresses the laws governing its operation should and must progress in step with business development."

Donald R. Richberg, general counsel National Conference on Valuation of Railroads, made a bitter attack on the unequal distribution of wealth, the mechanization of industry, "bland disregard" to keeping up buying power by wages, the "maze of holding companies," security issuing practices, and executives of the electric industry in general. He characterized the latter as greedy and seeking extortionate profits, and even discounted their public service motives. Mr. Richberg concluded by saying:

"The future of electrical power and the public is bound up in the future relations of man power and money power. It is dependent on the solution of that great problem of developing the social power necessary to control and utilize those superhuman physical powers now available to mankind. The industry may well be among the first to appreciate the urgent need for social controls to insure that the monster forces they are unleashing may be speedily harnessed in the service of mankind."

Guarding Bayonet Contacts of Truck Switches


Position of doors with breakers in compartments
Bumpers on switch truck
1¼" x ¼" strap
2½" x ¼" strap
Provision for padlocking
Spring hinge

To prevent unauthorized approach to the contacts on the back walls of the truck-type switch compartments, each cell in the West 111th Street substation of the Commonwealth Edison Company is provided with a swing door whose spring hinges cause it to follow the breaker truck as it is withdrawn. When the breaker is all out the door has closed itself. It is then padlocked. Bumpers on the truck frame push the door open as the breaker moves into the compartment.

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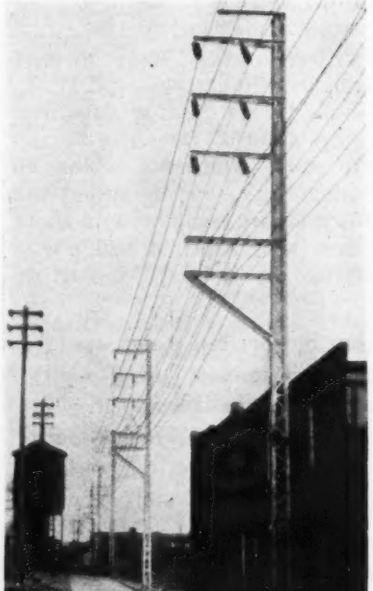
Side-Arm Construction Met Right-of-Way Limitations



In constructing a line in Huntington, W. Va., it was found that the narrow right-of-way available through the industrial part of the city necessitated an interesting expedient. Side-arm construction was adopted for towers bearing two 33-kv. circuits, a ground wire and several distribution services. By erecting the steel structures with a predetermined camber when unloaded the towers assume a vertical line throughout under full conductor installation. This line is on the property of the Appalachian Electric Power Company, a subsidiary of the American Gas & Electric Company.

Manufacturers Purchased 36,393,833,000 Kw.-Hr. in 1929

FOR the first time the U. S. Census of Manufactures gives data on purchased energy used by manufacturers and the price paid. The 1929 Census, released November 16 of this year, indicates a total use of 36,393,833,046 kw.-hr., for which the bill was $475,634,377, giving a unit average price of 1.31 cents per kilowatt-hour.

The total bill for fuels used for all purposes in manufacturing—heat, power and processes—was $1,498,228,952. Thus purchased energy was approximately one-third the fuel bill. The accompanying table gives an energy breakdown in manufacturing by states. Unit prices for power average 1.31 cents, with a variation from 0.45 to 2.37. In only eight states was power sold for less than 1 cent per kilowatt-hour and these states were fortunate in having large hydro possibilities. Also, it should be noted that the average price for power takes no account of sizes of loads, space factor between loads and load demands.

An interesting analysis is shown by tabulating the total utility plant generation by states for 1929 and showing these values in contrast with the purchased energy used in manufacturing. Here again the influence of hydro upon both power use and rates is noticeable; North Carolina, for example, with its hydro and textile industries contrasts sharply with other states.

In the group of five states using the greatest energy for manufacturing it is noticeable that Illinois sells a less proportion to manufacturing than the other states. The effect of domestic loads and a widely diversified business makes for stability in earnings and output. In five states the energy sold to manufacturing exceeds the total energy generated in utility plants. This results from the effect of imported energy or energy sold by industrial plants to other plants or both.

The total value of manufactured products in 1929 was $68,453,486,518; thus the bill for purchased power of $475,634,377 was six-tenths of 1 per cent.

Power Use and Cost in Manufacturing—U. S. Census 1929

State	Total Kw.-Hr. Generated	Per Cent Fuel	Generation Hydro	Kw.-Hr. Sold to Manufacturing	Per Cent Mfg. Kw.-Hr. to Total Generation	Revenue from Mfg. Kw.-Hr. Sales	Unit Price per Kw.-Hr. Mfg. Sales
New York	14,465,073,000	61.0	39.0	5,871,738,654	40.6	$65,534,258	1.115
Pennsylvania	8,154,652,000	89.5	10.5	3,501,286,469	42.8	50,595,260	1.445
Ohio	6,416,941,000	99.3	0.7	3,080,039,560	48.0	41,523,862	1.31
Illinois	7,369,263,000	96.8	3.2	2,120,376,599	28.8	32,993,252	1.55
Michigan	4,695,266,000	76.5	23.5	2,028,421,694	43.3	31,741,606	1.56
California	8,849,622,000	28.0	72.0	1,601,102,481	18.2	19,761,489	1.232
North Carolina	2,552,376,000	7.0	93.0	1,572,917,543	61.8	15,276,810	0.97
Massachusetts	3,026,426,000	83.0	17.0	1,409,874,874	46.5	25,245,975	1.795
Indiana	2,575,930,000	94.5	5.5	1,063,583,055	41.5	15,258,635	1.43
New Jersey	2,164,728,000	99.0	1.0	1,051,187,141	48.5	19,497,541	1.84
Tennessee	1,020,957,000	32.0	68.0	1,050,496,981	102.5	7,635,034	0.725
Wisconsin	2,275,608,000	57.5	42.5	934,848,936	41.2	12,422,930	1.33
Montana	1,613,668,000	1.0	99.0	818,476,124	50.5	3,674,980	0.45
Washington	2,552,325,000	14.5	85.5	782,921,745	30.5	6,055,431	0.775
Texas	2,801,316,000	99.5	0.5	728,090,318	26.0	9,793,126	1.34
Alabama	1,829,952,000	0.5	99.5	682,449,569	37.4	7,147,141	1.045
Missouri	1,220,661,000	94.0	6.0	679,869,818	55.5	10,881,108	1.595
South Carolina	1,457,499,000	9.5	90.5	660,456,682	45.5	8,201,316	1.24
Georgia	1,135,539,000	6.0	94.0	646,917,748	57.0	8,441,119	1.3
Connecticut	1,435,976,000	86.0	14.0	634,837,747	43.2	10,576,742	1.67
West Virginia	2,219,880,000	92.0	8.0	575,932,120	26.0	5,463,684	0.946
Maryland	2,010,799,000	37.0	63.0	463,644,743	23.0	6,369,143	1.375
Virginia	1,297,162,000	74.0	26.0	407,852,202	31.4	5,261,497	1.29
Iowa	1,499,476,000	47.5	52.5	392,856,735	26.3	5,345,154	1.355
Minnesota	1,202,307,000	45.5	54.5	388,944,690	32.0	6,093,993	1.56
New Hampshire	310,138,000	26.0	74.0	361,058,733	116.0	2,780,656	0.77
Maine	719,710,000	11.0	89.0	328,959,106	45.8	3,245,838	0.988
Oregon	1,161,386,000	34.0	66.0	315,759,337	27.0	3,418,766	1.082
Rhode Island	652,743,000	99.5	0.5	305,310,550	46.8	5,372,848	1.76
Kentucky	715,351,000	58.5	41.5	271,700,501	38.0	3,899,653	1.435
Louisiana	989,736,000	100.0	0.0	252,675,049	25.6	3,400,568	1.34
Kansas	1,007,049,000	98.0	2.0	221,312,759	22.0	3,698,465	1.67
Oklahoma	977,132,000	99.0	1.0	140,278,496	14.3	2,384,233	1.70
Arkansas	127,839,000	61.0	39.0	135,009,962	106.2	1,889,343	1.395
Arizona	283 023,000	32.0	68.0	131,192,858	46.3	7,147,141	1.015
Nebraska	533,235,000	94.0	6.0	127,627,906	23.8	2,011,202	1.575
Utah	402,005,000	27.5	72.5	102,696,546	25.3	1,327,538	1.295
Florida	670,333,000	97.0	3.0	98,600,142	14.6	2,040,763	2.065
Colorado	563,813,000	59.0	41.0	84,081,808	14.9	1,711,608	2.035
Mississippi	56,886,000	100.0	0.0	69,812,404	123.0	1,226,779	1.71
Delaware	52,867,000	100.0	0.0	66,864,785	126.5	1,059,262	1.585
Vermont	463,797,000	2.0	98.0	66,228,459	14.3	1,487,734	2.25
Idaho	894,417,000	0.5	99.5	61,855,526	6.9	580,096	0.94
District of Columbia	505,122,000	99.5	0.5	40,514,290	8.0	665,539	1.63
Wyoming	98,665,000	64.5	35.5	22,509,462	22.8	385,145	1.71
South Dakota	107,738,000	99.0	1.0	17,378,430	16.1	415,442	2.39
North Dakota	104,979,000	100.0	0.0	10,262,002	9.8	224,697	2.19
Nevada	43,840,000	5.0	95.0	6,670,667	15.2	131,789	1.975
New Mexico	67,179,000	97.0	3.0	6,349,040	9.5	150,377	2.37
Total and average	97,352,385,000	64.5	35.5	36,393,833,046	37.4	$475,634,377	1.31

Current Theft and Its Prevention

By S. A. FLETCHER
Commonwealth & Southern Corporation

ALTHOUGH many utility managers have long believed that they were free from loss of revenue by current theft, one utility recently found evidence of 1,500 cases of theft out of a total of 9,000 customers in one town. This means that one in every six of its customers gets some part of his electricity without paying for it. Another utility has recently begun an active campaign for detection of current theft and has found as many as 56 suspects in one day. Many meter men have long felt that their companies should pay more attention to theft detection and prevention, and today managers are beginning to agree with them.

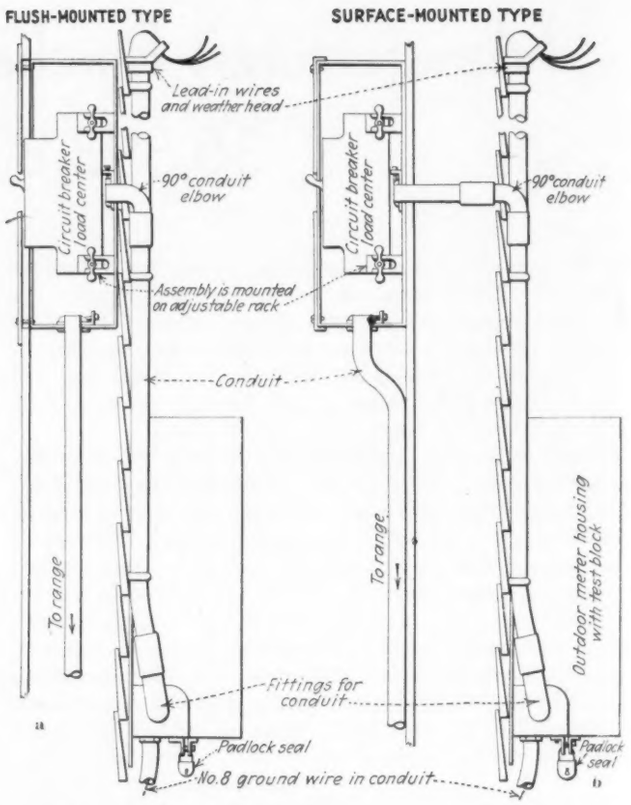
One of the simplest means of detecting theft is to offer a small reward for each detection by any employee. Another way is that used by a utility with approximately 45,000 customers, where two well-trained meter men are continually tracing each service to make sure they are properly metered. This includes a complete examination of the meter wiring and even a check of the connected load where the rate is dependent upon it. These men cover the entire system annually and have brought in very gratifying returns.

The plan followed by another utility will serve to show a successful method. In this company the management became convinced that there must be losses, due in part to the continued depression which had caused a large number of cut-outs for non-payment and in part to its own practice of being unable to cut all services at the pole when the meter was removed. This latter occurred most frequently in duplex houses and apartments. Accordingly, all cases of irregular service that were reported were, when verified by two special investigators, paid for at $1 per report. These covered:

1. Services left hot with no meter.
2. Meters jumped and jumpers found.
3. Meters unsealed.
4. Evidence that jumpers had been used.
5. Part of customers' load tapped ahead of meter by permanent wiring.
6. Meter stopped from any cause.
7. Any other irregularity in service wiring, such as fire hazard, etc.

The meter readers in particular were instructed to be on the watch for these conditions, although any person making such a bona fide report was eligible for receipt of the $1 per report. The results were immediate and astounding. In the first two weeks more than 500 cases were reported and a great majority were verified by the investigators. This was in a town of approximately 120,000 population.

What did this management do to correct it? A special investigator takes the daily grist of reports and goes out with a lineman to verify them. When they find a hot service with no meter and customer taking service or not, the lineman if possible disconnects the service at the pole. If this is not possible, due to service to other customers being fed from the same service wires, these men make a new report of how service must be changed to



Figs. 1a and b—Method of connecting outdoor meter connection boxes and load-center breakers

Excerpt from 1931 Code

"Section 405 (i) Service Equipment.—The relative arrangement of the service switch and fuses and the meter shall provide that the switch shall be on the supply of the fuse and that the meter shall be protected by the fuse, except that

"(3) Where the meter is installed in conjunction with sealable equipment with no live parts or wiring exposed, on alternating-current circuits not exceeding 300 volts between conductors and 150 volts to ground, the meter may be placed on the supply side of the switch and fuses provided the capacity of the latter does not exceed 60 amp. when fuses are used or 70 amp. when circuit breakers are used."

overcome this situation. If it is a case of theft, these investigators verify the report and get as much additional information as possible and report to the service department. It then cuts the service, which is only restored when the customer has complied with the rules of the company regarding new services, as he then comes in the class of a new customer applying for service.

In some instances where jumping of the meter is indicated by the condition of bared places on the wiring, which causes a hazardous condition, the customer is notified by registered letter (with return receipt required) that his wiring is in a hazardous condition and must be corrected in a certain number of days or the service will be discontinued. He is requested to have his electrical contractor see the proper person in the company to find out just what must be done to correct the conditions. These registered letters have resulted in 100 per cent compliance with the company rules.

The utilities quoted have all adopted the same method of preventing further theft once it has been found. It is not enough merely to collect an estimated amount to cover energy previously unmetered. Something must be done to make it impossible, or at least very difficult, for the customer to steal again.

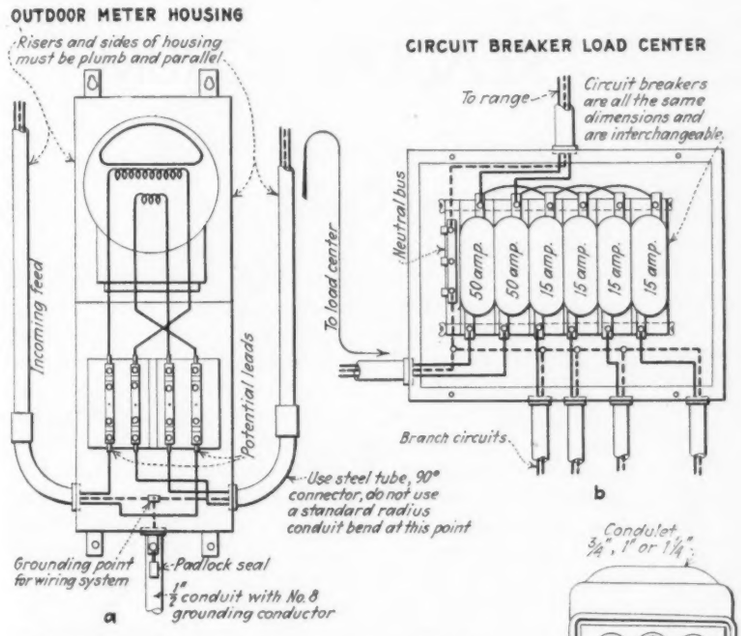
The installation of the meter in an all-metal box, outdoors, with the service entering and leaving this box in rigid conduit, has been adopted as the best means to stop theft. It incloses the meter completely, with a suitable test block to permit of testing the meter, as well as disconnection when service is to be discontinued.

This connection box is owned by the utility and no part of the customer's equipment is contained in it. There are no fuses or switches inside of it, or anything that can unintentionally cause interruption to the customer's service. Hence, the boxes bear the following inscription:

> Property of the.....Power Company.
> This Connection Box Contains No Fuses.
> Do Not break This Seal.

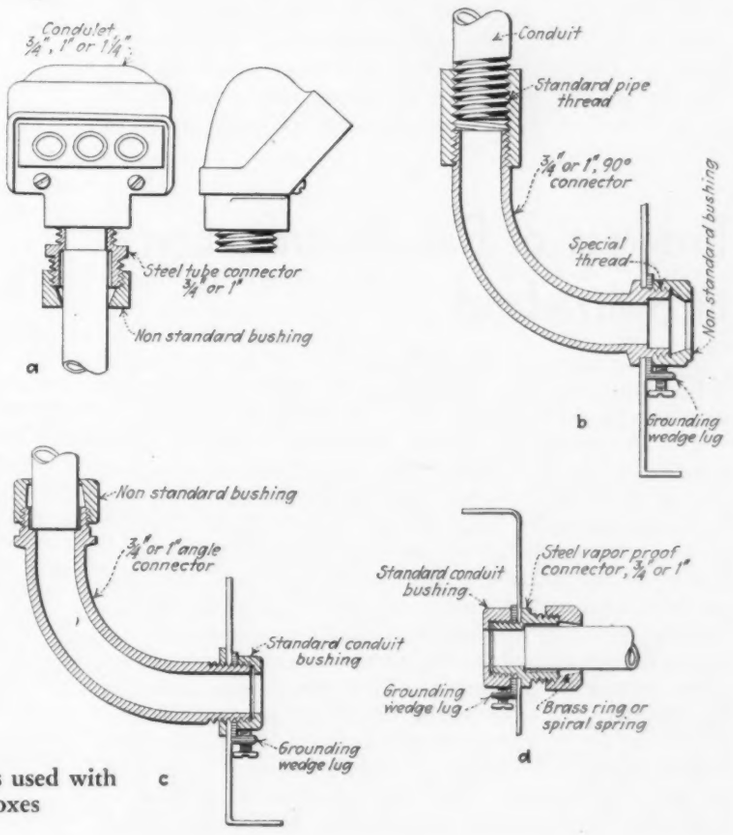
Similar installations can also be made with an indoor box of much smaller dimensions. It is like the outdoor box, except that it does not inclose the meter, and is fitted with an end wall of the standard type used in the present safety switch box. The low cost of such boxes, either of the outdoor or indoor type, makes these types of installation entirely justifiable.

Details of an outdoor meter connection box that may be connected with load center circuit breakers are shown herewith. It will be noted that the two outside terminals of the test block are connected to the supply and the two inside terminals are connected to the load. This makes a positive method of identification of the load and service wires. The test block is of the well-known type with removable center links, which can also be used to continue service to a customer when the meter is to be tested. A set of circuit breakers for a range and four branch lighting circuits have been substituted for the usual main line switch and



Figs. 2a and b—Outdoor meter connection box and load-center circuit breakers

The meter connection box has a cover which may be padlocked in place. A window at the top exposes the meter dials to view.



Figs. 3a, b, c and d—Fittings used with outdoor connection boxes

fuses and distribution fuses. The fittings used with these boxes may be either standard rigid conduit or steel tubes.

While the National Electrical Code does not authorize the use of steel tubes, some city inspectors are accepting them on the basis that they are equally as good as rigid conduit and cost less to install. For this reason the fittings shown were selected, adaptable to either type. The angle fitting has a much larger radius than those available for rigid conduit and this makes for ease in pulling the wires through the conduit.

Inasmuch as the National Electrical Code did not until recently permit meters to be installed ahead of the fuses, these boxes have not been long in service. (The 1931 Code, just now available, contains a paragraph permitting this method of connection, as shown in the accompanying panel.) However, enough results have been secured already to show considerable theft prevention.

Examination of the bills of ten customers in one small locality where outdoor boxes were installed indicated a revenue increase of more than $10 per month per customer the first month. These were, of course, small business customers, not residential. Another company which adopted the same practice found in 44 residential installations an average increase in the customers' consumption from 59 to 93 kw., or 34 kw.-hr. per month per customer increase. This company found that it cost it approximately $13 per customer to install these outdoor boxes, as the company was forced by the lack of suitable laws to make all changes at its own expense.

Customers hesitate to tamper with a box located outdoors in full view, and besides they are deterred by the nameplate with its warning. In case of persistent seal breakage, which should be reported by the meter reader, the customer can be cut off for tampering with the property of the utility. Only one utility using these outdoor boxes has reported any case of a broken seal, and that was but one case, which was not repeated when the customer was warned that he must not tamper with the seal. The increased consumption shown on meters installed in these boxes is evidence that they are not being tampered with.

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Progress of Rail Electrification in Switzerland

Electrification of the first section of the Bodensee-Toggenburg Railway connecting St. Gall, Wattwil and Nesslau, in Switzerland, was completed on October 4, 1931. According to Alfred Marschall, electrical engineer in Berlin, this railroad was one of the most expensive in the country when built in 1910 because of the mountainous route, long tunnels and viaducts. Grades of 18 per cent existed on the main line and 25 per cent on one of the branches. Nearly one-eighth of the total section is through tunnels, and the viaducts had to be "overworked," to use Mr. Marschall's expression.

Power is supplied by the Switzerland Railways from their substation at Gossau, joint lines being used in Romanshorn, St. Gall and in the Wattwil-Ebnat-Kappel section in Toggenburg. Power is fed to the newly electrified section at four points along the 64 km. of track at 15 kv., $16\frac{2}{3}$ cycles. "Warped" multiple suspension is used for the overhead construction, according to Mr. Marschall, a galvanized-iron cable being used for the messenger wire except in tunnels, where copper-clad steel is used. Insulators are of the plate type, 280 mm. in diameter. Connection between the contact wire and insulators is made by means of a spring ring that absorbs shocks. Profile iron masts are used to support the conductors in the open and light yokes in the tunnels.

Four-motor locomotives weighing 63 tons and having a maximum rating of 1,500 hp. are used. Mr. Marschall reports that they are capable of hauling a 250-ton train up a 15 per cent grade at 55 km. per hour. Extensive use is made of two motor coaches weighing 53 tons, which are capable of hauling a 100-ton passenger train under the same conditions as the locomotives. The drive consists of a hollow shaft with tangential springs on the wheel spokes.

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READERS' FORUM

Questions Conclusions on Transformer Outages

To the Editor of the ELECTRICAL WORLD:

I wish to call attention to the method of analyzing the data presented in the article "Transformer Outage Determined by Ground Conditions," by R. Philip Hart, and to the erroneous conclusions which can be reached by such a method.

According to the author's analysis the two burn-outs and eight fuse blowings in the lower ground resistance class were negligible. The two burn-outs and one fuse blowing in the second (20- to 50-ohm) resistance class were also negligible. The many burn-outs and blown fuses, 213 in number, which occurred in the high ground resistance class are the all important failures and indicate that the protection was inadequate.

The results given in the article would be true indication of the relative protective value of the grounds, provided that there were equal numbers of grounds in each of the three resistance classes. To illustrate, let us set up a hypothetical case and analyze it:

Suppose that of the 20,627 transformers there were 50 with grounds of less than 20 ohms resistance, ten with grounds of 20 to 50 ohms resistance and 20,567 with grounds of over 50 ohms resistance. In this case ten out of 50, or 20 per cent of the arresters, with ground resistance in the lower bracket failed to protect the transformer. Thirty per cent of those in the second bracket failed. The remaining 213 out of 20,567 with high ground resistance is only 1.04 per cent, and is negligible in comparison with the two other classes. We thus see that the author's data can be used to reach two very different conclusions.

The point which I wish to bring out is that in order to reach a logical conclusion it is as necessary to know the ground resistance on the transformers which did not fail as that of the ones which did fail.

Although they may hold our interest, or teach us a much-needed lesson, a true picture cannot be composed entirely of "horrible examples."

ROLAND R. MINER.

Kansas Gas & Electric Company,
Wichita, Kan.

Men of the Industry

M. G. Lord Directs Operations of Colorado Utility

M. G. LORD, who was elected vice-president of the Southern Colorado Power Company in charge of operation, as announced in the November 7 issue of the ELECTRICAL WORLD, began his career in the electrical industry as an apprentice at the T. H. Smith Electrical Works, Denver, Colo., in 1895. Subsequently he advanced to be foreman of the works.

Later Mr. Lord purchased an interest in and erected an electric lighting plant at Meeker, Colo., and this undertaking he operated until 1906. It was in 1907 that he entered the service of the Pueblo & Suburban Traction & Lighting Company, where he took charge of the electrical repair department. This property was later purchased by the Southern Colorado Power Company. In the course of his connection with this utility Mr. Lord has been chief electrician, assistant superintendent and superintendent of power plants and shops.

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GEORGE N. BROWN, formerly associated with the Ohio Brass Company, has joined the commercial staff, at headquarters, of the National Electric Light Association as manager of the electric refrigeration bureau. Mr. Brown spent eight years in electric railway work after being graduated from Cornell University. Since the War Mr. Brown has been engaged in electrical sales work, first as manager of the New York office of the Pittsburgh Transformer Company and then for four years was located at Pittsburgh as vice-president in charge of sales of this company. It was in 1927 that he joined the sales organization of the Ohio Brass Company as district manager, first of the Philadelphia office and later the New York office.

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O. W. WALTER, research engineer Hall Electric Heating Company, Inc., Philadelphia, Pa., now is assistant professor in electrical engineering at the College of the City of New York and is residing at Hastings-on-Hudson.

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A. J. GRANT, formerly connected with the meter department of the Westinghouse Electric & Manufacturing Company, Newark, N. J., has removed to Ottawa, Ont., Canada, where he will assume new duties in the physics department of the National Research Council.

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A. E. KENNELLY, professor emeritus of electrical engineering Harvard University and Massachusetts Institute of Technology, Cambridge, Mass., has gone to Japan. At the invitation of the Institution of Electrical Engineers of Japan, he will deliver a group of lectures during November before five Japanese universities as the first visiting American professor under the Iwadare Foundation.

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DR. H. C. PARMELEE, editorial director of the McGraw-Hill Publishing Company, Inc., has been elected a vice-president of that company by the board of directors. Dr. Parmelee brings to his new executive position a background that covers the presidency of the Colorado School of Mines and some twenty years' experience in important editorial capacities in the McGraw-Hill organization, including the editorship of *Chemical and Metallurgical Engineering*.

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G. H. HARRIES, major-general U. S. A. (retired), formerly vice-president for H. M. Byllesby & Company, Chicago, Ill., and financier of some note, has retired from the active engineering field in which he was an outstanding figure for a number of years. General Harries in the course of his career has been treasurer of the National Electric Light Association and president of the Association of Edison Illuminating Companies, the American Electric Railway Association and the Illuminating Engineering Society. He has established residence in Los Angeles, Cal.

J. J. Murphy Heads Railroad and Utilities Commissioners

J. J. MURPHY, who was elected president of the National Association of Railroad and Utilities Commissioners, as announced in the October 31 issue of the ELECTRICAL WORLD, has occupied the position of Railroad Commissioner of South Dakota since 1912, having been elected for four consecutive six-year terms, the present term to expire January, 1937.

Mr. Murphy was born in Juneau, Wis., but at an early age removed to South Dakota, where he has since that time resided. He taught in the public schools for several years, later engaging in the grain business, which he followed until the spring of 1909, when he was elected county auditor, an office he occupied for four years before assuming the duties of Railroad Commissioner.

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J. MONROE MERKER has retired as electrical engineer at New Albany for the Public Service Company of Indiana, according to G. H. Barr, division manager of the company at New Albany. Mr. Merker began his career with the Gaynor Electric Company, Louisville, in 1891. During the next four years he was city electrician for New Albany and consulting designer for the Gaynor company. In 1894 he became associated with the local public utility company, then known as the New Albany Light, Heat & Power Company. Four years later he was promoted to chief electrician when

the property was purchased by the United Gas & Electric Company and in 1908 he became electrical engineer and statistician for that utility. From 1914 until the present time he served as electrical engineer for the Interstate and the present company.

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H. B. Briggs, Jr., who has been located in New York, N. Y., as electrical engineer for Theodore E. Ferris, has joined the Bath Iron Works Corporation at Bath, Me.

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P. A. de Mars, who was formerly professor of electrical engineering at Tufts College as well as consulting engineer, Boston, Mass., recently was chosen technical director of the Shepard Broadcasting Service, Inc., in that city.

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Surendra N. Bose, formerly deputy chief electrical engineer of the Tata Iron & Steel Company, Ltd., Jamshedpur, India, is now chief electrical engineer of that company. Though a native of India, Mr. Bose spent sixteen years in the United States, his connections including the General Electric Company, the Pennsylvania Railroad Company, Cazenovia Electric Company, Messrs. C. P. Perin and S. M. Marshall, consulting engineers of New York, and the J. G. White Engineering Corporation. During that period of time Mr. Bose obtained a wealth of practical engineering experience, his work including design, construction, steel mill electrification, etc. It was in the summer of 1926 that he went to India.

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J. B. Stevenson has been appointed central district advertising manager, it was announced recently by the Westinghouse Electric & Manufacturing Company. He will supervise advertising for Westinghouse in important industrial centers of Pennsylvania, Ohio, West Virginia and other states. Mr. Stevenson is a graduate of Haverford College and the Carnegie Institute of Technology, receiving a bachelor of arts degree from the former and a degree in commercial engineering from the latter. He was formerly associated with Westinghouse in the locomotive rate department in East Pittsburgh. Later, he was engaged in advertising and sales promotion work for the E. A. Lundy Company and the American Window Glass Company in Pittsburgh. Mr. Stevenson returned to the Westinghouse company in 1928 in the capacity of assistant advertising manager of the central district. He now takes the place of J. M. McKibbin, who was recently appointed sales promotion and advertising manager of the newly organized industrial department of the company at East Pittsburgh.

E. F. Stone New Vice-President of Colorado Utility

E. F. Stone, who was elected vice-president of the Southern Colorado Power Company in charge of sales, as announced in the November 7 issue of the Electrical World, had his early education and training in Norfolk, Va., where, after two years at the Norfolk Academy, he began his business career as apprentice in electric wiring and service repairs, later becoming superintendent of street lines, construction and repairs for the Norfolk Railway & Light Company. In 1905 he was made general superintendent of construction of transmission lines to the Jamestown Ex-

position, held in 1907, and equaling a world's fair in size and importance. This was a large electrical engineering project, involving transportation problems as well as power and light, and Mr. Stone directed the construction of trolley, lighting and power systems. In March, 1909, he removed to Pueblo, Colo., to join the Pueblo Suburban Traction & Lighting Company and was with the company in 1911 when it was purchased by the H. M. Byllesby Company. He served as superintendent of transmission and distribution lines in Pueblo and the Arkansas Valley, east to La Junta. In 1924 Mr. Stone was appointed assistant general manager of the Southern Colorado Power Company, the position he occupied until his recent promotion.

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Lyman Winn, who was engaged in sales engineering work for the Shelby Electric Company at Memphis, Tenn., recently joined the engineering staff of the Standard Electric Company in that city in a similar capacity. Mr. Winn was a member of the committee which wrote the constitution and by-laws of the Memphis section of the American Institute of Electrical Engineers. He also has contributed to technical literature at various times.

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Eugene F. LeNoir, formerly president and general sales manager of the Union Electric Manufacturing Company of Milwaukee, Wis., has become associated with the Allen-Bradley Company of Milwaukee. Mr. LeNoir, a prominent figure in the motor-control field, was for eleven years active in the manufacture of master drums, motor starters and other control equipment. In his new capacity he will contact with motor manufacturers through the Allen-Bradley district offices and agents, as a special representative.

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OBITUARY

W. A. Quarrier, district manager of the Appalachian Electric Power Company, Charleston, W. Va., died recently at Roswell, N. M. Mr. Quarrier, who was 49 years of age, was born in Charleston, and had been with the Appalachian company since 1918.

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Thomas F. Malone, treasurer of the Lundin Electric & Machine Company, Boston, Mass., died on November 15 at the Peter Bent Brigham Hospital in that city. He was born in South Boston in 1870, and after some years with the Boston Edison company joined the Lundin company's staff about twenty years ago.

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J. Oliver Morris, president of Page Morris, Inc., Albany, N. Y., died November 15, at the age of 46, as the result of an operation. Mr. Morris removed to Albany in 1921 from Hartford, Conn., to become vice-president and general manager of the Electric Supply & Equipment Company. Early in 1929 he joined the Page Morris organization, which distributes electric refrigerators.

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John E. Judson, vice-president of Ford, Bacon & Davis, consulting engineers, died November 12 in Stamford, Conn. Mr. Judson was born in New Haven and was graduated from the Sheffield Scientific School of Yale University in 1887. After remaining with the New Haven Railroad Company in its engineering department for several years, he became a consulting engineer in Pawtucket. Almost 40 years ago he affiliated himself with Ford, Bacon & Davis.

Financial and Statistical News

AUTHENTIC evidence of business revival can be found today at a much earlier stage of the upswing of the business cycle than was possible in the final stages of earlier depressions, Martin J. Insull finds from an exhaustive study of conditions, especially in smaller communities. Fundamental productive industries closest to the soil are the first to record the turn, Mr. Insull states.

——PUBLIC UTILITY BONDS HAVE CONTINUED TO DRIFT this week, but with greater evidences of firmness than any other group. Ten standard issues now average 91.8, against 90.8 at the beginning of the month and 94.7 a year ago. Utility stocks have receded about three points on the average this week.

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Employee Stock Sale Plan Is to Be Reconsidered

PREVIOUSLY announced plans for the sale of common stock to officers and employees are being reconsidered by the Electric Bond & Share Company officials. A special meeting has been called for December 7, to consider the cancellation of the plan adopted July, 1929, and to consider the retirement of approximately 590,000 shares of the outstanding common stock of the company.

The vote of the stockholders in 1929 authorizing the adoption of this plan provided that it should be administered under the authority of a committee of the board of directors, consisting of E. K. Hall, George H. Howard, Edwin G. Merrill, Lewis E. Pierson, William C. Potter and Frederick Strauss. In a letter to the stockholders, which accompanies the formal notice of the meeting, this committee states that it has considered the effect of the plan and is of the opinion that it no longer operates for the benefit of the company or its stockholders.

Stock held by subsidiary

The stock covered by the plan is now held by a wholly owned subsidiary and has been contracted for sale for future delivery under a standard form of purchase agreement. The agreement provides that none of the stock will be deliverable until the expiration of a term of 7½ years of continuous employment subsequent to such sale, except in the case of death or as may be determined upon in other special circumstances. The cessation of employment, except in the case of death, terminates all rights and obligations under the agreement and in such case there is an obligation to reimburse the employee for the money paid by him under the plan, with interest at the rate of 6 per cent.

The committee recommends to the stockholders that the plan be canceled, that all stock of the company held by this subsidiary be surrendered and canceled and that the employees be reimbursed with interest for the amount paid by them in cash, which is the basis provided for as above stated. The aggregate amount so advanced by them, including interest, to be so reimbursed, is a little less than $3,000,000. This action, if taken, will result in the reduction of the outstanding shares of common stock by approximately 590,000 shares or approximately 4 per cent of the total amount outstanding as of December last.

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Insull Companies to Raise New Capital

TWO INSULL ORGANIZATIONS have applied to the Illinois Commerce Commission for authority to issue additional common stock. Commonwealth Edison Company is planning to issue additional capital stock to the extent of 10 per cent of the outstanding stock, or approximately $15,700,000. If the issue is authorized the stock will be offered at the par value of $100 a share to stockholders of record of December 15, payment to be made in full or in either quarterly or ten monthly installments.

Public Service Company of Northern Illinois has applied for authority to issue additional common stock without par value to the extent of 12½ per cent of the outstanding stock. The value of the new stock will amount to $9,773,000. If authorized, the stock will be offered at $100 a share to stockholders of record of December 15, buyers to have the privilege of payment in full or in quarterly or ten monthly installments.

The Chicago Curb Exchange has admitted to trading on a when-issued basis these stock subscription rights.

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Bankers Urge Changes to Facilitate Recovery

THAT no industry or business has more successfully withstood the violence of the economic depression than the utilities was emphasized by speakers at the convention of the Investment Bankers' Association, held at White Sulphur Springs, W. Va., last week. At a time when there are severe criticisms of utility management and methods, in certain quarters, the unusually strong affirmation of confidence in present management, on the part of the bankers, proverbially critical, is significant.

One report read:

The demands of small commercial businesses have not only suffered no loss, but have slightly increased. The demands of domestic consumption have steadily and persistently increased. A man may put up his motor car but he cannot dispense with electricity, the cheapest and most indispensable servant of his home.

Total kilowatt-hours sold the country over have fallen off but moderately and aggregate net earnings of operating properties not at all. This is a remarkable accomplishment. It has meant, in addition to persistent efforts to increase business, the most careful revision and curtailment of operating costs at every possible point, but the thing to be observed is that results have been forthcoming, where in so many other businesses similar efforts have been so largely unavailing.

If these facts inspire confidence, the level of many securities of light and power companies, both bonds and stocks, that are now so low as to bear little relation to intrinsic worth, will not long remain so.

Fear of radical legislation was cited as one of the chief factors working against reviving confidence, hence pre-

venting the raising of adequate capital to meet growing service demands. As a corrective, managements are urged to use frank, courageous methods, to correct their own mistakes and to discuss controversial questions openly. Another part of the report read:

What is needed is direct statements of managements themselves in connection with the essential problems of their own situation. There is no danger that in the end the common principles back of the business and the common needs will not by such approach automatically come through to the surface and will be understood and appreciated for what they are worth. Service must be put above profit.

Self-preservation being the first law of nature, and assuming a desire on the part of each of us to remain in business, it is of vital interest to each of us to safeguard himself from radical, inimical legislation which, should it prevail, would restrict, hamper, or even destroy the investment banking business.

Such being the case, the question remains whether self-defense can best be carried on individually or collectively. There would appear to be one answer. With every state in the Union, save one, having in effect a law in some form specifically relating to the investment banking business and to some degree of regulation thereof; with a tendency in times such as these to attempt the cure of all economic evils, real or imaginary, through new legislation, it would seem that did this association not exist, some such organization would of necessity be called into existence.

Data on long-term credit

Other problems discussed included a further study of money rates and the discontinuance of the tax on capital. The money and credit advisory special committee was headed by H. R. Hayes, of Stone & Webster and Blodgett, assisted by George N. Lindsay and Allen M. Pope, president-elect of the association. Referring to the two compilations of brokers' loans made by the Federal Reserve and the New York Stock Exchange, the committee recommended that further studies should be made to ascertain more definitely what additional information is needed to have credit conditions more readily and clearly understood.

A recommendation was made that the federal tax on capital gains and losses be eliminated after the close of the present fiscal year. This suggestion was made by the committee on federal taxation under William H. Eddy of Chase-Harris Forbes Corporation. The recommendation states in part:

It is inconceivable that the government would sacrifice its good faith with the taxpayers by taking advantage of the existing situation to eliminate this tax provision as applied to the current year of depressed values, thereby depriving taxpayers of the benefits from tax losses taken this year in an effort to obtain partial compensation for the heavy taxes paid on capital gains for so many years.

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Fall Rise Begins, but Moderately

SEPTEMBER brought the usual autumnal increase in average daily energy output and revenue, it is shown by returns received in the ELECTRICAL WORLD's regular survey of electric light and power operations. But the monthly totals continue lower than at the same period in 1930. Revenue, allowing for non-reporting companies, is estimated at $172,240,000, against $174,940,000 last year, the decline being 1.6 per cent; output was 7,110,640,000 kw.-hr., or 2.8 per cent less than in 1930. Operating expenses show a cut of 4.4 per cent, leaving substantially the same income for both years.

Water power fell to less than 29 per cent of the total output, more than 200,000,000 kw.-hr. short of the production in August, appreciably under even last year's drought-restricted output. Fuel consumption increased, but in smaller ratio than the corresponding production, indicative of maintained progress in thermal efficiency.

During this period of less than normal industrial activity regional comparisons merit more than usual scrutiny. Because the various sections of the country differ markedly in respect to their dominant product, the indication of general economic conditions afforded by electric power statistics is significant.

The growth in revenue compared with August was general; of the nine geographical regions only the Pacific

New England leads in improvement; whole middle U. S. below 1930

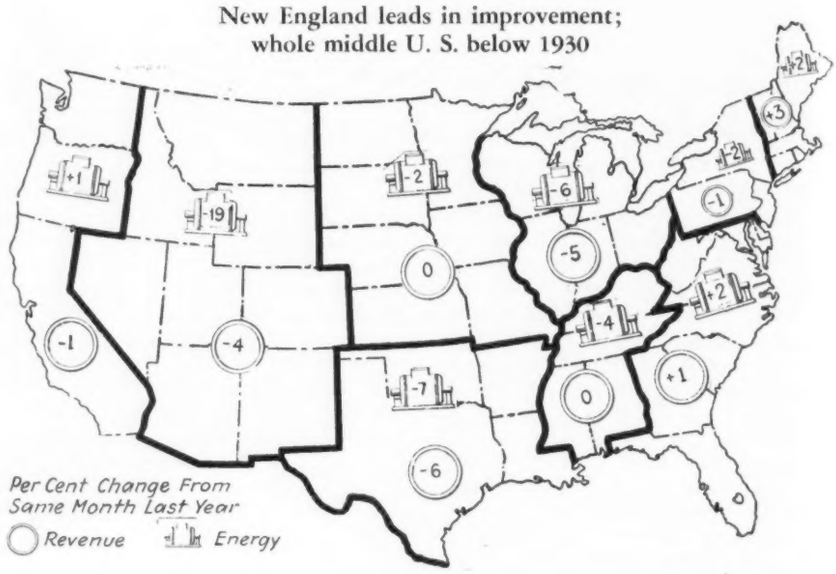


Table I—Central-Station Financial Operations in the United States

Compared with Corresponding Month of Previous Year

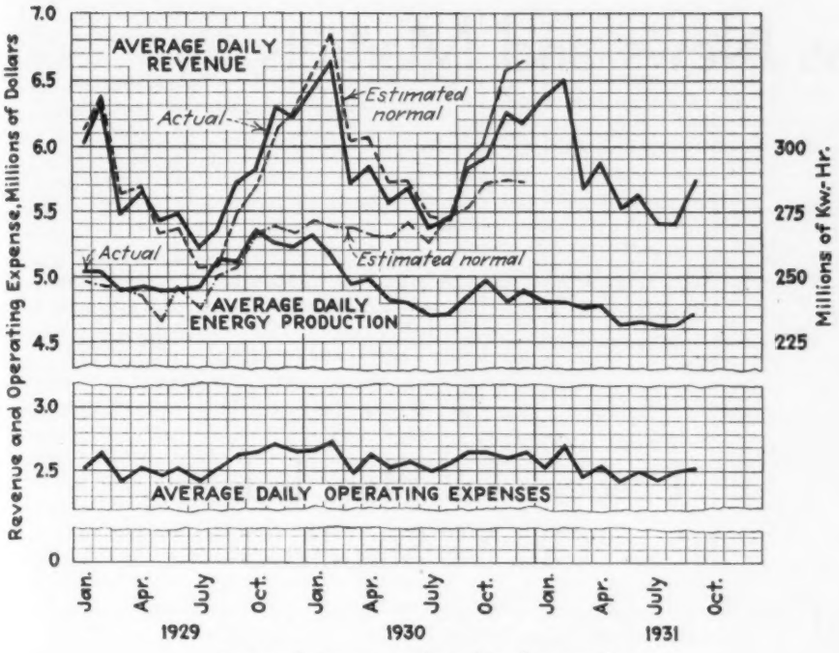
Month	Total Gross Revenue from Sale of Energy*			Total Operating and Maintenance Expense†		
	1931 Thousands	1930 Thousands	Per Cent Inc.	1931 Thousands	1930 Thousands	Per Cent Inc.
June	168,510	170,200	—1.0	74,340	76,400	—2.7
July	187,190	166,200	+0.6	75,170	77,500	—3.0
August	167,380	168,100	—0.4	75,590	78,300	—3.5
September	172,240	174,940	—1.6	75,300	78,800	—4.4

Table II—Central-Station Fuel Consumption in the United States‡

Compared with Corresponding Month of Previous Year

Month 1931	Coal		Oil		Gas	
	Short Tons	Per Cent Increase	Barrels	Per Cent Increase	Thousands Cubic Feet	Per Cent Increase
June	2,721,290	— 7.8	612,973	+ 0.4	11,549,126	+17.1
July	2,915,510	— 8.9	701,549	— 1.4	12,626,895	+20.7
August	2,981,389	—12.6	713,197	— 3.9	12,478,249	+13.3
September	3,029,936	—12.9	675,212	—18.2	13,480,756	+28.0

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.
†Do not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions. ‡As collected by the U. S. Geological Survey.



September up-turn less than last year's

States showed a small decrease, due possibly to variations in the demand of power for irrigation. New England once again gives evidence of leading the country in recovery by exceeding the corresponding operations in 1930, with an increase of 3 per cent in revenue and 2 per cent in energy output.

The great agricultural zone sweeping across from the southeastern seaboard into the upper western part of the Mississippi Valley, and embracing the South Atlantic, East South Central and West North Central States, had a revenue equaling or exceeding last year's, though their aggregate energy consumption was somewhat less.

But the central industrial area, the Southwest and the Mountain States seem to show no tendency, as yet, to move up to former levels. Both revenue and energy output remain decidedly less than in 1930. Table IV shows this in more detail.

Table III—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1931	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
June	7,017,221	—3.1	2,637,643	—5.5	4,379,578	—1.6	1,901,000	+5.8
July	7,259,767	—1.3	2,508,327	—4.1	4,751,440	+0.2	1,956,000	+4.7
August	7,153,557	—3.1	2,256,102	0	4,897,455	—4.4	2,025,000	+1.5
September	7,110,640	—2.8	2,035,459	—1.1	5,075,181	—3.4	1,963,000	—0.2

Table IV—Regional Operations, Revenue and Energy Output in September, 1391

Compared with Corresponding Month of Previous Year

Region	Revenue		Energy Generated, Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	172,240	—1.6	7,110,640	—2.8	2,035,459	—1.1	5,075,181	—3.4
New England	17,530	+2.9	487,639	+1.9	171,885	+66.6	315,754	—15.8
Middle Atlantic	43,010	—0.9	1,755,295	—1.6	374,518	+11.1	1,380,777	—4.5
East North Central	40,180	—4.6	1,610,623	—5.9	120,737	+25.3	1,489,886	—7.8
West North Central	14,790	—0.3	475,821	—1.5	84,219	—3.3	391,602	—1.1
South Atlantic	18,850	+0.6	823,677	+2.1	365,079	+62.5	458,598	—21.2
East South Central	6,120	+0.1	282,270	—4.2	198,016	—4.2	84,254	—3.9
West South Central	10,300	—6.0	411,593	—7.2	4,058	+137.5	407,535	—7.8
Mountain	4,440	—3.8	245,519	—19.0	174,934	—27.1	70,585	+11.9
Pacific	17,020	—1.0	1,018,203	+0.9	542,013	—28.9	476,190	+93.0

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central-station operations.

Weekly Output Flat

AFTER THE SAG in the week ended November 7 the output of electric light and power plants continued last week on the same level, somewhat lower than in the recent past, but with a slightly better showing against 1930, being down 5.2 instead of 5.9 per cent. In 1930 the records also show a downward movement, contrary to the seasonal trend, beginning the third week of October.

In the week of November 7 the Atlantic seaboard showed a decrease of 3.2 per cent from the corresponding 1930 week; for New England, taken alone, it was 1.3 per cent. The central industrial region decreased 10 per cent; the Chicago area, alone, 6.2 per cent; the Pacific Coast 4.5 per cent. In the succeeding week the corresponding percentages were, respectively, 2.1; 1.0 increase; 8.8, 5.3 and 3.9. decrease.

Comparable weekly totals, as announced by the National Electric Light Association, are shown in the table.

	1931	1930	1929	1928
October 10	1,653	1,724	1,806	1,651
October 17	1,656	1,729	1,799	1,665
October 24	1,647	1,747	1,824	1,678
October 31	1,652	1,741	1,816	1,688
November 7	1,628	1,728	1,798	1,697
November 14	1,623	1,713	1,794	1,696

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NEWS BRIEFS

An extra dividend of 50 cents, in addition to the regular quarterly dividend of 62 cents, has been paid by the Weymouth Light & Power Company on the capital stock, par $25.

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Toledo Edison Company has been authorized by the Ohio Public Utilities Commission to issue 1,387,500 shares of no-par common stock to be exchanged ten for one for its present outstanding 138,750 shares of $100 par common.

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New York Stock Exchange has approved for listing 1,440,410 additional shares of Electric Power & Light Corporation's no-par common stock upon official notice of issuance and payment in full under terms of rights offered to stockholders.

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Holders of twenty-year 6 per cent gold debentures of the Empire Public Service Corporation, due in 1950, have been notified of the formation of a protective committee which requests deposit of the debentures with the Bankers Trust Company, depositary. The committee comprises Edward L. Love, chairman; John C. Adams and Leland E. Yeager. George E. Buchanan is secretary.

Business News and Markets

Sentiment Better in Building Field

A MORE WHOLESOME TONE in October business sentiment, although not yet felt in the construction industry, is likely to bear favorably on the future revival of this industry, according to statements in the October statistical reports issued by F. W. Dodge Corporation.

In connection with figures on construction contracts awarded in the 37 states east of the Rockies, this organization points to an October "revival of business and financial confidence from a state verging on panic toward a more healthy anticipation of constructive solutions of underlying financial problems. While this turn of sentiment is the essential first step toward recovery, it has not yet gathered sufficient momentum to affect favorably business volume or construction volume."

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Building Up the Appliance Load

EVIDENCE OF INCREASING SALES of domestic appliances are coming in from various parts of the country. For example, in the fall washer campaign of the Central Maine Power Company total sales amounted to 288, against quota of 162, thus beating the quota by 77 per cent. The campaign lasted four weeks and the 288 sales were made in 26 days. The company has about 58,000 domestic customers. The house organ from which this information was taken comments: "Evidently Maine hasn't heard of the depression."

The sale of 201 electric refrigerators on a single order for three apartments climaxed a campaign by the Cumberland County Power & Light Company to convert all Portland apartment house owners into users of electric refrigeration. The equipment of the three large buildings with 201 units is expected to play no small part in closing deals with other owners in the territory, it is understood.

From the South comes the news that the electric range sales of the Savannah Electric & Power Company have taken on new life with the new low price recently made effective, and with the company doing the wiring necessary for installation at no cost to the property owner or tenant. The company has thus removed the two great obstacles that stood in the path of the electric range business, the high price of the range and the cost of wiring.

A range sale now being conducted by the El Paso Electric Company offering an electric range completely installed at a very moderate price is attracting widespread public interest. It is being widely advertised, both in newspapers and by means of special radio programs, and the campaign will be continued until Christmas. Sales to date have been satisfactory and prospects are good for many future sales.

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Leaders Tell How Industry Can Be Stabilized

BEFORE the Academy of Political Science at the Hotel Astor in New York last week, Gerard Swope, president of the General Electric Company, made answer to some of the criticisms of his plan for the mitigation of industrial depressions which he originally presented in an address before the National Electrical Manufacturers' Association on September 16. Mr. Swope emphasized the "voluntary action" element in his plan, as opposed to compulsion, and reaffirmed his belief that stabilization of industry, particularly of employment, is possible by the procedure he has suggested, with full protection of the public interest.

Whether his plan is meritorious or not, be pointed out, the experience gained in endeavoring to put it into practice would of itself tend to correct its weaknesses. To believe, as some do, that industry simply cannot be stabilized, Mr. Swope asserted, is to adopt what Senator La Follette has termed the "counsel of despair," which would be a negation of all effort toward progress.

"No doubt," said Mr. Swope, "the plan for stabilization of industry along lines that I have suggested would have to be modified as we have more experience, but such experience can be had only by trying one scheme or another to solve the problem, which, unsolved, leaves us with all the present chaotic, unhappy and finally unendurable consequences."

Discussing the dissemination by trade associations of knowledge regarding trade practices and ethics, and the standardization of products, Mr. Swope quoted an opinion of the Supreme Court, handed down in 1925, which held that "the natural effect of the acquisition of wider and more scientific knowledge of business" could hardly be deemed a restraint of commerce, or at least not an unreasonable restraint, "or in any respect unlawful."

Mr. Swope added that he believed American industry has long since passed the point where trade associations would curtail production, causing increases in prices to the public, a fear expressed by some people.

Modification of the Sherman anti-trust law along the line recommended by the American Bar Association to remove the criminal aspects of the law and to allow companies to make agreements which would be filed with the Federal Trade Commission and the Department of Justice was one method suggested by Mr. Swope for encouraging companies to participate in the plan by joining their respective trade associations. Another method which he suggested was to allow participating companies to deduct from their federal taxes the sums which they contribute to employee welfare funds.

Government as referee

To those critics who expressed the belief that his plan would mean in reality putting the government in business, Mr. Swope made answer by pointing out that throughout the plan he had advocated "that the initiative be taken by the trade associations and not by the government." The government supervisory body, he disclosed, would act as a referee or umpire to interpret unfair competition between members, or if necessary to protect the welfare of the public by its interpretation of agreements filed with the Federal Trade Commission or its study of production and price trends.

"If, as already suggested, Congress, by modifying and clarifying the Sherman law, encourages companies to join trade associations and offers inducement for such companies to stabilize employment, and these measures are approved

and supported by public opinion, almost every company will join in this constructive endeavor and no compulsion will be necessary."

Mr. Swope went on to reiterate that he considered the stabilization of employment, meaning assurance of employment with unemployment insurance if necessary, to be the most important feature of the plan.

"The result of taxing industry for a portion of the cost," he said, "will be to put a premium on industry's finding ways of stabilizing employment. The collateral effects, therefore, of unemployment insurance will be much more important to the employee, to industry and to society than unemployment insurance itself.

"An important factor, which I think is basic, is that the cost of the product will include these items and will therefore be paid for by the users of the articles and not in general by members of the community through taxation."

Mr. Swope added that even if industry itself falls short of "an ideal accomplishment," more progress will be made and it will be better done and cost less "than if the government, either state or federal, endeavors to do it."

Exemplifying the steps that a community can take, Marion B. Folsom of the Eastman Kodak Company described the Rochester unemployment benefit plan. At present nineteen companies, very different in size and product, are participating; they have 28,000 employees, 40 per cent of the city's total. Having developed a method for smoothing out seasonal variations by forecasting, planning production, building up inventories, varying the number of hours, price concessions during slack seasons and other devices, the statistical groundwork is also prepared for meeting depressions.

The Rochester plan is based on company co-operation rather than government compulsion. The companies administer their funds individually. Under the present scheme these should be built up to meet conditions in 1933, and therefore they are not designed to meet the present emergency.

Rochester does not believe that cycles involving severe unemployment are inevitable. But to that end certain steps are necessary: (1) Creation of local reserves; (2) greater stabilization to eliminate seasonal fluctuations; (3) accumulation of individual unemployment reserves, toward which state and federal government could help by exempting those funds from taxation; (4) establishment of public employment agencies; (5) use of the shortened week; (6) development of plans for making useful work during slack seasons and interrupting it in prosperous times; (7) organization for vocational guidance in school.

Contractors and Workers Will Stimulate Wiring

AN EMPLOYER-LABOR PLAN to relieve unemployment in the electrical construction industry has just been announced by the Electrical Guild of North America and the International Brotherhood of Electrical Workers. Together the two organizations, comprising contractors and workers, propose to create business and work in the industry by modernizing American homes, stores and buildings equipped before the era of rapid electrical development and known to be inadequately wired. Skilled electricians are to act as salesmen on a small commission basis, their primary object being to stimulate employment. If only 3 per cent of the potential market in the United States for repairs, extensions and wiring for new equipment is reached, it is estimated that the expenditure will amount to $126,000,000, divided roughly into $50,000,000 in wages and $76,000,000 for materials, which, in turn, gets into wages.

The project, according to the outline furnished by Louis K. Comstock, president of the guild, and H. H. Broach, head of the electrical workers' union, will be carried out in nearly 600 cities and towns in the United States and Canada. It has the indorsement of President Hoover's organization for unemployment relief and had been submitted for the approval of the National Electric Light Association and the National Electrical Manufacturers' Association.

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Depicts Results of Trebling Residential Lighting Business

J. F. O'BRIEN OF THE Westinghouse Lamp Company, New York, told the New England division of the National Electric Light Association at a meeting in Boston on Monday of this week that with energetic commercial activity revenues from home lighting could be increased from $21.60 to $61.25 per year, largely by the provision of more outlets and modernized units in place of present equipment.

Typical connected wattage increases advocated for representative rooms were: Living room, 250 to 540; dining room, 158 to 230; bedchamber, 98 to 190; bathroom, 70 to 100 minimum; halls, 65 to 150; kitchens, 87 to 200 exclusive of appliances. The addition of a new 60-watt outlet and unit in every wired home would increase central-station revenue about $70,000,000 per year, the speaker said. In his talk Mr. O'Brien cited a tendency toward replacing low-wattage units which create shadow atmospheres by higher-power lamps placed for maximum convenience of utilization, uniformity of light distribution and more cheerful effects. D. W. Atwater of the same company also spoke on colored lighting of homes for Christmas decorations.

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Adequate Farm Wiring

THE ARMORED CONDUCTOR and metallic flexible conduit section of N.E.M.A. recently circularized utilities, contractors and municipal inspectors on the general program of education in rural districts with regard to adequate and appropriate wiring installations on the farm for house, barn, garage and field use, by distributing copies of Cornell Extension Bulletin No. 204, entitled "Electric Wiring for the Farm."

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TRADE BRIEFS

W. M. Bailey, C. D. Fletcher and F. A. Shailer have joined the Dubilier Condenser Corporation, New York.

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Doehler Die Casting Company and Bohn Aluminum & Bronze Corporation have announced an arrangement by which the Doehler Die Casting Company has taken over the Bohn die casting division in exchange for the former's permanent mold department.

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R. J. Gaudy, formerly executive engineer of the Sessions Engineering Company, has formed the R. J. Gaudy Engineering Services, with offices at 228 N. La Salle Street, Chicago, Ill.

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E. L. Bradbury has been appointed sales manager of Gillinder Bros., Inc., Port Jervis, N. Y.

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Southern States Equipment Company, Birmingham, Ala., has announced the appointment of E. J. Ford as sales agent to represent it in the states of Iowa and Nebraska and of the Industrial Products Sales Corporation, St. Louis, Mo., as its sales representative in Missouri.

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J. G. Corrin has been appointed sales representative by the Meter Devices Company, Canton, Ohio, for its products in the state of California.

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New York Metal Prices

	Nov. 11, 1931 Cents per Pound	Nov. 18, 1931 Cents per Pound
Copper, electrolytic	7	6.75
Lead, Am. S. & R. price	4.05	4.05
Antimony	6.75	6.85
Nickel, ingot	35	35
Zinc, spots	3.60	3.60
Tin, Straits	22.13	22.75
Aluminum, 99 per cent.	23.30	23.30

Market Conditions

SIGNS of improvement are materializing into definite orders in the Southwest, although in the Middle West and on the Pacific Coast tangible evidence that the turn has been made is still very scarce. Railroad and industrial buying has not expanded greatly.

——BUSINESS THROUGHOUT THE EAST AND IN NEW ENGLAND is still limited largely to day-to-day requirements.

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NEW ENGLAND

—A QUIET TONE *in electrical equipment sales was reported in this district for the past week, with small motor sales as the sole item indicating volume of sales. Switch and control equipment is moving, but orders are irregular and in small lots. Central-station supplies are quiet and inquiries are few.*

Industrial heating interest maintains an encouraging outlook, with inquiries active and negotiations in progress for installations. Electric cooking equipment sales have fallen off, but recently orders for apparatus involving 50 and 60 kw. capacity were placed. Sales of commercial counter appliances, including heaters, beaters and ovens, is reported brisk. Encouraging prospects for several large installations of complete commercial kitchen equipment are ahead. Scheduled materials are quiet and according to one prominent distributor counter sales have fallen off.

CONSTRUCTION PROJECTS

School Board, Greenfield, Mass., plans manual training shops in proposed junior high school to cost $375,000. Viking Flying Boat Company, New Haven, Conn., plans hangar and machine shop to cost about $50,000. School Board, Portland, Conn., plans manual training shops in new senior-junior high school to cost over $250,000.

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SOUTHWEST

—THE OPTIMISTIC CONVERSATIONS *of the past few weeks are at last materializing into definite orders of substantial proportion, and on the whole it can be reported that this has been one of the best weeks experienced by the Southwestern district in a long time.*

The Great Atlantic & Pacific Tea Company has just placed through the Kansas City office of the Federal Brilliant Company one of the largest orders for an outdoor electrical advertising display purchased in many months. A local utility has placed an order for transformers and a switchboard to cost approximately $31,000, while an Arkansas utility is buying $9,000 worth of cable and oil switches and disconnecting switches. The contractors of the Madden Dam project in Panama have ordered a 2,500-hp. motor, switchboard, transformer and auxiliary electrical equipment to cost about $15,000. A chemical plant in the St. Louis industrial zone is installing $3,500 worth of small motors. The regular run-of-mine of small items are beginning to move in greater volume and apparently there now is every reason to believe that the bottom of the depression has been finally left behind.

CONSTRUCTION PROJECTS

Treasury Department, Washington, D. C., is having plans completed for Court House and Post Office at St. Louis, Mo., to cost $3,000,000. Atchison, Topeka & Santa Fe Railway Company, Topeka, Kan., is completing plans for passenger station at Oklahoma City, Okla., to cost over $500,000. University of Texas, Austin, Tex., has authorized plans for engineering building to cost more than $250,000.

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SOUTHEAST

—VOLUME OF SMALL ORDERS *for electrical materials is holding up satisfactorily in the Southeast, though large orders are somewhat scarce.*

—A GEORGIA COMPANY *last week ordered oil circuit breakers, network protectors, potential and distribution transformers and junction boxes amounting to approximately $30,000 and is in the market for two cars each of wire and crossarms.*

A Tennessee power company ordered two cars of bare and weatherproof copper wire, a small Carolina company ordered poles amounting to $500, a Tennessee industrial ordered $6,000 worth of magnet wire, a North Carolina textile ordered $4,000 worth of lighting fixtures and transformers, while another cotton mill in the same state ordered two pump motors costing approximately $2,500. A Georgia industrial has let a contract for plant remodeling which will call for $5,000 worth of electrical materials. An independent telephone company in Tennessee ordered 150 miles of copper line wire for replacing old iron lines.

CONSTRUCTION PROJECTS

Michigan State College, East Lansing, Mich., plans extensions in power plant with additional equipment to cost about $60,000. Signal Corps Procurement District, United States Army, Chicago, Ill., will receive bids until November 24 for plugs, cords, mounting plates, etc. (Circular 26); at same time, for terminal boxes (Circular 27). Standard Oil Company of Indiana, Chicago, Ill., approved plans for expansion in oil refinery at Whiting, Ind., to cost over $8,000,000. Eaton Spring & Axle Company, Cleveland, Ohio, has filed plans for an addition to cost over $150,000. City Council, Minneapolis, Minn., has authorized an ornamental lighting system to cost $22,000.

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PACIFIC COAST

—THOUGH MANY CONTRACTORS *are working fair crews, there is little new work coming up. Electrical machinery manufacturers report few orders for usual staples, but a scattered showing of special material, reaching, however, a fair volume.*

—FIELD SALESMEN *are optimistic because of the increasing number of inquiries, but sales executives say that actual order volume has failed to realize the hopes of early October.*

Ten months' building record shows the Bay area running even with last year and southern California about 35 per cent behind, with Los Angeles and San Francisco each running about 40 per cent behind last year for October itself. The Los Angeles area provides the best prospects and orders of the week, the outstanding orders covering city awards of $102,000 for Allis-Chalmers generators and equipment and $43,000 worth of General Electric transformers. An encouraging industrial order covers $50,000 worth of electrical dredging machinery sold by General Electric to a Bay district company.

Other business, largely special power apparatus, covers a $4,000 bank of Westinghouse induction regulators for Palo Alto, $20,000 worth of Westinghouse elevator equipment for San Francisco's twin war memorial group, $17,000 worth of motor and shovel control equipment for Hoover Dam, three General Electric induction regulators for an irrigation district, a $30,500 wiring award for the university of California gymnasium and a Westinghouse turbine

and miscellaneous small motors for an Oklahoma oil company.

A fair movement of motors from 50 hp. down, the majority under 25 hp., to miscellaneous industrials, irrigation districts and dealers, was reported in the Seattle territory last week, but sales of apparatus, wire, conduit, cable, poles and pole line hardware were reported as practically negligible. One jobber reported the sale of 50 motors, 100 hp. down, for household heating units in eastern Washington; another, 50 machines from 25 hp. down to scattered industrials, also 24 transformers from 50 kv. down to a central station; another, eight machines from 15 hp. down to a woodworking plant; another, ten machines from 25 hp. down to dealers, and another, 30 motors from 50 hp. down to pulp and paper mills and scattered sources and 200 meters from 5 to 25 amp. and 50 transformers from 5 to 50 kv. A contract for lighting fixtures in the $1,600,000 marine hospital under construction in Seattle has been let to the Severin Electric Company, San Francisco, for approximately $14,000.

Survey for the U. S. Department of Commerce airways radio plant, to cost $70,000, has been started at Spokane, the plant consisting of a sending and receiving station and two 125-ft. towers. The Seattle city purchasing agent is taking bids for 62 armature shafts, rough turned, for the street railway department and has opened bids for 10,000 screw knob insulators.

CONSTRUCTION PROJECTS

Eastern Airplane Manufacturing Company, San Gabriel, Calif., is having plans drawn for aircraft manufacturing plant to cost over $100,000. United Artists Theaters of California, Inc., Los Angeles, Calif., plans motion picture theater at Berkeley, Calif., to cost $300,000. Stockton, Calif., plans ornamental lighting system to cost over $75,000. Portland Art Association, Portland, Ore., has plans for art museum to cost $160,000. Homestake Electric Company, Woydak, Wyo., plans transmission line to Lead, S. D., for service in mining district, estimated cost $450,000.

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MIDDLE WEST

—GENERAL BUSINESS *in the Middle West section continues to drift along an uneven course. The volume of business remains substantially the same, with very little tangible evidence of improvement.*

—A BETTER GENERAL FEELING *is being observed. The major industries continue in relatively the same position, with a slight improvement observed in the steel industry.*

Resumption of automotive manufacturing has not progressed as rapidly as hoped for, but some slight improvement is being made. Railroad purchasing is still decidedly off and the prospects for much activity in equipment purchases before the first of the year are not very promising. Carloadings continue to hold up fairly well, showing less of a seasonal decline as compared to last year. Wholesale and retail trade is fairly even, although unseasonable weather is affecting retail sales somewhat. Concerted advertising in retail lines apparently has had little effect. Some of the interesting orders placed this week include 114 600-amp., 15-kv., single-pole, single-throw disconnect switches, 125 10-amp. maximum demand meters, 131 10- to 50-amp. capacity watthour demand meters, "Mazda" lamps valued at $150,000 and one carload of asbestos products.

CONSTRUCTION PROJECTS

Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until December 1 for one motor-generator set for Hampton Roads, Va., navy yard (Schedule 6905); until November 24 for 32 centrifugal ventilating sets and spare parts for Norfolk, Va., yard (Schedule 6893). United States Engineer Office, Mobile, Ala., will receive bids until November 24 for one complete Diesel-electric generating set and switchboard (Circular 158).

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EASTERN

—CONFIRMATION OF SIZABLE ORDERS *for subway cars and electrical equipment, tentatively placed a few weeks ago by the Board of Transportation, New York, referred to in these columns at that time, go to swell the totals for current account. Thus, the picture presented is not quite accurate with regard to immediate business, which continues to mark time in a manner now too long familiar.*

—INDUSTRIAL PROSPECTS *seem to offer the best promise for the next month or more, for with gradual advance in plant capacities in basic lines, buying revival naturally is anticipated. Government orders have tapered off temporarily, but early resumption of call is looked for.*

General Electric Company has secured a contract at $2,400,000 for air-break motors and allied apparatus for 500 subway cars for New York. The American Car & Foundry Company has the award for the cars, at a price of $10,700,000, and will build the units at its Berwick, Pa., shops, where capacity will soon be advanced with addition of about 1,500 men to the working force. A railway in northern New York has placed an order with a state manufacturer for substation equipment to cost $67,000. National Electrical Supply Company and John A. Roebling's Sons Company are successful bidders for cable for the Army Signal Corps. Otis Elevator Company has taken sizable contracts for electric elevators for three large buildings at Boston, New York and Baltimore.

Automotive plant activities are a bright spot in the industrial field. Ford Motor Company has an electric motor replacement program under way at its Dearborn, Mich., plant, calling for about 27,000 a.c. units to replace d.c. motors heretofore in service; work will cost over $5,000,000. Following, the company will carry out a similar improvement at its Lincoln division works, estimated at more than $400,000. Studebaker company will soon retool its idle plant at Detroit at a cost of over $350,000, for the production of a new automobile. Other automotive companies in the Detroit district will carry out similar programs. American Locomotive Company will increase operations at its Schenectady plant, adding about 1,500 men to the force. Automatic Electric, Inc., has secured an order for about 600 complete automatic telephones, finder switchboards and equipment for three battleships for the United States Navy.

CONSTRUCTION PROJECTS

Signal Supply Officer, Signal Corps, United States Army, Army Base, Brooklyn, N. Y., will receive bids until November 24 for 560 voltmeters (Circular 46); until December 1 for 778,000 ft. of wire (Circular 48). Construction Quartermaster, Army Department, Fort Monmouth, N. J., is preparing plans for radio laboratory to cost over $250,000. New York Central Electric Corporation, Rochester, N. Y., plans extensions in lines at Jasper, N. Y., and vicinity, including substation facilities. Board of Education, Pottstown, Pa., plans manual training shop in proposed junior-senior high school, to cost over $350,000. Department of Supplies and Purchases, Philadelphia, Pa., will receive bids until November 24 for incandescent lamps. General Purchasing Officer, Panama Canal, Washington, D. C., will receive bids until November 25 for transformers, meter-testing blocks, voltmeters, toggle switches, fuse clips, 25,000 ft. copepr wire, and other electrical supplies (Schedule 2701).

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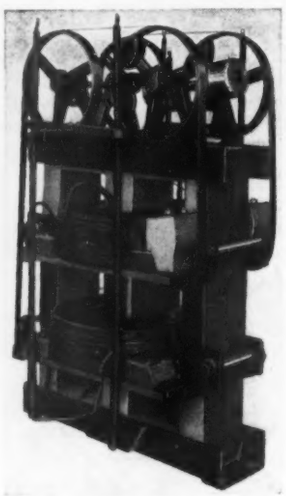
Link Belt Earnings Decline Sharply

LINK BELT and subsidiaries report for the nine months ended September 30 net profit after depreciation, federal taxes and other charges of $618,522, compared with $1,802,111 last year. For the three months ended September 30 net profit was $166,540, compared with $209,350 in preceding quarter and $495,912 in third quarter last year.

New Equipment Available

Constant-Current Pole-Type Street Light Transformer

A CONSTANT-CURRENT street-lighting transformer, designated type SL, embodying many new features, has been announced by the Moloney Electric Company, St. Louis, Mo. This transformer operates automatically and can be mounted on poles in remote districts



or where subdivided downtown lighting circuits are desired. It can also be adapted for manhole use.

These transformers embody a new type of construction and the operating mechanism is of entirely new design. When the primary coil is energized, the repulsion between the primary and secondary coils causes both coils to move to a position fixed by the weight and the forces of repulsion. The coils are hinged, the primary at one end and the secondary at the other, and a parallel motion is obtained by the steel band which is fastened to the moving ends of the coil, passing over the pulleys.

Horizontal Air Heaters

A LINE OF HORIZONTAL electric air heaters for industrial applications is announced by the General Electric Company. The heaters consist of a number of General Electric strip heaters mounted in black-japanned, perforated, pressed-steel cases. Each is equipped with 3 ft. of armored cable and a three-heat snap switch mounted on a standard conduit box. They are designed for wall or floor mounting. Five ratings are listed, 1,000 watts at 115 volts and 1,000, 2,000, 3,000 and 4,500 watts at 230 volts.

Some of the advantages claimed for the new line are as follows: Free air circulation, providing maximum heat; ease of installation; lightness and strength. The heaters are simply mounted on wall or floor and connected to the power line; units are easily moved from one job to another, etc.

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Renewable Core Single-Phase Motors

A LINE OF SINGLE-PHASE MOTORS having renewable pre-wound cores that permit greater speed of repairs in case of accidental damage has been announced by the Westinghouse Electric & Manufacturing Company. The rotors have two windings which act together to give these motors ideal torque curves.

The frame and feet are cast in a single, rigid unit which cannot warp or twist out of alignment. Every motor winding is given two separate and distinct pregnations, being thoroughly baked after each to protect the windings from the deteriorating effect of moisture, oil and abrasive dust. Standard motors may be connected for operation on either 110 or 220 volts, single phase.

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Space Heater Has Nickel Chromium Element

A SPACE HEATER of a new design, its heating element being nickel chromium alloy, has been announced by Cutler-Hammer, Inc., Milwaukee, Wis. A highly refractory granular compound is used for insulation. A new process of imbedding the element in this compound under immense pressure makes the new space heater immune to vibration and jarring, it is claimed.

The heaters have a normal rated capacity of 500 watts. They are furnished for 100-125 volts and 200-250 volts, either direct or alternating current.

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A MERCURY FLUSH TUMBLE SWITCH, similar to the standard flush tumble switch except that the circuit is made and broken by mercury in a sealed tube, has been announced by the General Electric Company.

The switch, which is silent in operation, has extremely long life and makes and breaks the circuit without an open arc, has a composition box slightly deeper than the customary switch boxes. It is made only in the single-pole type.

Starting Switch Has Pedestal Mounting Case

A MOTOR-STARTING SWITCH designated CR-1062-C2, for use with general purpose motors and with pedestal mounting, particularly adaptable for application in the textile industry, has been announced by the General Electric Company. The switch is of the three-pole type with double-break silver "umbrella" shape contacts of strong construction. Molded arc chutes supporting the movable contacts totally inclose the contact tips and all arcs. The double-break silver contacts reduce arcs to a minimum even with a maximum horsepower load and with the motor stalled, thus providing a high factor of safety.

Thermal overload relays are of the solder film ratchet type and are inclosed to prevent damage to the switch from short circuit. They may be readily removed from the front of the switch. Relay heaters are built into molded cases which have protective sides, safeguarding the heaters from mechanical injury.

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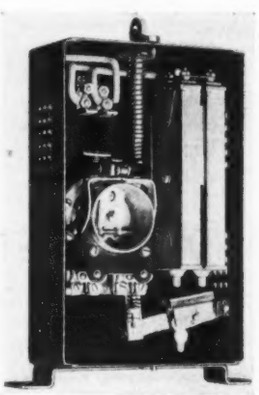
Treadle-Operated Motor Controllers

A CONVENIENT MEANS OF SECURING smooth control of speeds for small machines driven by d.c. or universal motors is announced by the Allen-Bradley Company, Milwaukee, Wis., in the bulletin 500, treadle-operated controllers. Operation of the treadle compresses a graphite-disk compression resistor. This type of resistor allows a



stepless variation in motor speed and permits the operator to obtain the exact speed that best suits the nature of the work.

A self-contained disconnect switch opens the motor circuit with a quick break of the "off" point and a self-contained short-circuiting switch bypasses the resistance at full speed.